Chapter 6

Findings and Recommendations

The Western Water Policy Review Advisory Commission (Commission) offers the following recommendations, fully recognizing that there are no simple solutions to the complex water problems of the next 25 years. Our public hearings and investigations have confirmed that, throughout the West, people are struggling energetically and creatively to address water problems. Innovative, collaborative approaches are being used almost everywhere. Mostly, we seek to promote the best of these efforts.

Further, we recognize some hard facts:

- The West's waters are overappropriated in many places.
- Substantial amounts of water are needed to address obligations to Indian nations and tribes, to restore endangered species, and to meet the needs of a rapidly growing population.
- National, state, and local objectives for the use of water may differ.
- Existing uses of water have deep economic, social, and political roots.

Therefore, there will be fewer truly win-win solutions in the future. Instead, we seek solutions that equitably share the burden and minimize social disruption.

We can improve the ways that federal, state, and local agencies work together and the way that laws and regulations are administered, but this will not make these hard facts go away—it will not make the fundamental competition for water less real. Instead, we seek to promote tools for working through these conflicts, to reaffirm national obligations that have not been fully met, and to promote shared investment in the resource to obtain greater environmental health and, from that, reduced social conflict.

The Commission offers both general and specific recommendations. First, recognizing the importance of general goals to guide programs as conditions change, the Commission developed Principles of Water Management for the Future. These may provide general guideposts against which current and future policies and programs might be measured. Second, the Commission offers specific recommendations in six areas:

1. *Improving Decisionmaking, Reducing Conflict*: Improving how we collect and use water-related information, work with the full range of water interests, and reach decisions.

2. *Management of Water and Water Facilities*: Improving the way federal water and flood control facilities are managed and operated to provide sustainable benefits.

3. *Governance*: Organizing and integrating the activities of federal, state, and local entities as they make decisions affecting water resources at the river basin and local watershed levels.

4. *Obligations to Indigenous Nations and Tribes*: Meeting our water resources trust and treaty commitments to Native Americans.

5. *Resources Management and Restoration*: Restoring and protecting aquatic systems, and bringing water use into sustainable balance with the environment, in accordance with applicable laws.

6. *Protecting Social Resources*: In addition to meeting obligations to Native Americans, supporting water and land use that sustains economically and environmentally sound ranching and farming operations and the rural communities and cultures which they help support.

Principles of Water Management for the Future

The Commission adopts the following principles of water management.

Ensure Sustainable Use of Resources

Use and manage water and related resources so that at the national, regional, and local levels, environmental, social, economic, and cultural values can be supported indefinitely. All water resources policies and programs in the West must recognize and address the dramatic current trends in population growth and movement. Consideration must be given at all levels of government to the management of growth impacts on water and associated land and open space resources. The sustainability of policies which encourage growth must be assessed carefully in relation to the available resource base.

The Commission's overarching principle—the sustainable use of resources—is a principle articulated by the President's Council on Sustainable Development (1996). The principle is fundamental to the management of a finite resource like water and the life, culture, economies, and environments that depend upon it. However, we must recognize that sustainable use may require an adjustment in water uses. This will be a challenge for our water institutions in the future.

Maintain National Goals and Standards

National standards and goals for the quality of water and related resources have played a substantial role in maintaining and restoring resource health. There is a continuing need for national standards and goals.

The Commission has repeatedly heard from across the political spectrum that, while some may question the precise construction or implementation of national environmental statutes such as the Endangered Species Act (ESA), the Clean Water Act, and the Safe Drinking Water Act, all acknowledge that these enforceable standards have been a critical motivating force to bring action, often collaborative action, to address deteriorating environmental conditions and the unsustainable use of water supplies.

Emphasize Local Implementation, Innovation, and Responsibility

Federal, tribal, state, and local cooperation toward achieving national standards should define the future of water policy. Where possible, responsibility and authority for

achieving these national standards should rest with nonfederal governing entities. Reasonable flexibility should be allowed and innovation encouraged in the approaches taken to achieve national standards within a framework of monitoring and accountability.

The Commission recognizes that the best solutions to problems are nearly always fashioned by those most directly involved and affected. The Commission promotes approaches that link the efforts of local groups and communities with national standards and programs. Where meeting national standards has been set as the objective, flexible and creative local implementation usually produces the most effective and durable results.

Provide Incentives

Wherever possible, use economic and other incentives, including voluntary water transfers, to achieve national or local water resource goals. Existing incentives and policies for water use and associated land management should be examined to determine whether they promote or impede sustainable use of resources and serve contemporary social goals. Funding should provide incentives for state and local entities to achieve resource goals.

The Commission recognizes the powerful force of the marketplace and programs that reward individual action. Especially where resource use is controlled by a system of property rights, voluntary action has great advantages in meeting changing societal needs. The more that we promote and support mechanisms to voluntarily put water use on a sustainable basis, the more we can avoid the involuntary changes that result when requirements of state and federal law are triggered.

Respect Existing Rights

Acknowledge and respect existing treaties, compacts, and equitable apportionments with states and tribes. Respect existing water rights and state appropriation systems.

The Commission recognizes the very important role that these legal mechanisms play in developing and protecting water supply and use and believes that any necessary changes in water use should take place within these systems in order to provide certainty to water right holders and predictability of the process for change.

Promote Social Equity

Determining and fulfilling tribal rights to water and providing universal access to safe domestic water supplies should be a priority. We must also recognize that local economies have developed throughout the West as a result of government policies designed to encourage certain land and water uses. As those policies evolve, regardless of the reason, people and communities affected by such changes may need time and assistance to make a transition. Water transfers should be done with full consideration of the communities of origin, third party transfers, and unintentional consequences and should be open to participation by affected parties.

The challenge for the future is to meet our obligations to tribes, the needs of the environment, and the growth of the West, while helping traditional water communities adjust to these new forces and shape their own future.

Organize Around Hydrologic Systems

Strive to make tribal, state, and federal water programs and decisionmaking more efficient and effective. To help address the problems created by multiple, and often conflicting, jurisdictions, authorities, and program objectives, we should organize or integrate water planning, programs, agencies, funding, and decisionmaking around natural systems—the watersheds and river basins. This will require integrating institutional missions, budgets, and programs, as well as their congressional oversight. Duplicative or overlapping programs and activities should be integrated or modified. Planning and management of land and water, surface water and groundwater, water quantity and quality, and point and nonpoint pollution must be coordinated.

The Commission joins with many other advisory bodies in recognizing the logic of managing water and related programs on a river basin or watershed basis. This requires integration and coordination across jurisdictional (federal, states, local) and functional lines (management of land use, water quantity, water quality, fish and wildlife, etc.) and may require reorganization of existing offices and agencies to maximize efficiency.

Ensure Measurable Objectives, Sound Science, Adaptive Management

National, regional, and local water resource goals should be repeated as measurable objectives. Performance should be assessed through open, objective, scientific studies, subject to peer review. Where knowledge is incomplete, actions should be based upon the best available data within a framework of monitoring and adaptive management. Determination of the best use of resources should take into account social, economic, environmental, and cultural values.

We have incomplete knowledge of water systems and how to manage them sustainably. Thus, it is even more important that we set goals and objectives explicitly and measure progress toward those goals in a open forum, using the best available data and analysis. Only in this way will our knowledge grow and our policies improve.

Employ Participatory Decisionmaking

National, regional, and local resource decisionmaking must be open to involvement and meaningful participation by affected governments and both interested and affected stakeholders. Sufficient information about the consequences of resource decisions should be made available to the public.

Some of the greatest strides in resources management have come in the area of citizen participation. Nevertheless, agencies in some areas need to provide additional meaningful opportunities for public participation. Further, agencies should look for ways to link local and national interests in place-based problemsolving, to bring difficult resource decisions to timely resolution, and to involve the public in ongoing monitoring and stewardship of their resources.

Provide Innovative Funding

Given declining federal budgets, innovative sources of funding and investment, including public and private partnerships, must be found to manage and restore western rivers.

We are in the midst of a major transition in the source of funding for water projects and water management. Many new, innovative approaches to

funding exist, utilizing public and private funds, nonprofits, volunteer efforts, user fees, and other means. The challenge will be to shape these approaches, along with declining federal dollars, into sustainable, stable programs.

Recommendations

1. Integrating River Basin and Watershed Governance

Perhaps the most useful and durable recommendation that the Commission can make is to promote mechanisms that help integrate the management of river basins and watersheds across agencies, political jurisdictions, functional programs, and time. This integrated governance will help improve our process of problemsolving and resources management in many areas.

The Shaping Forces

Several important forces argue for a new approach, and provide hope for its success:

1. The tremendous increase in the number of local watershed initiatives and groups, and the great energy and creativity they bring to resolving resource problems.

2. The value of driving regional and even basin-level programs through a bottom-up expression of values, goals, and commitments, generated by people's concerns about their local resources and communities.

3. The increasing need for federal, state, and tribal partnerships to manage collaboratively at the river-basin level to avoid legal gridlock and provide direction for comprehensive programs and expenditures.

4. The diminishing federal budget, creating the need for better priority setting, coordination, and efficiency in expenditures for all agencies, and the need to leverage federal funds with new sources of financing.

5. The need to manage more on an ecosystem or watershed basis, recognizing the consequences of many programs and actions within the watershed. The growing need for high-quality municipal supplies, and the importance of protecting the watersheds that provide them.

6. The growing need for efficient processes of planning and conflict resolution to address issues that involve many interests across many jurisdictions.

The Principal Goals

The integrated governance approach seeks to:

1. Improve decisionmaking and management at the river basin level by bringing all of the key political and agency decisionmakers into basin forums.

2. Clarify national and river basin goals by developing measurable objectives for basin management.

3. Improve the efficiency of agency activities at the basin level by requiring coordination and integration of programs and budgets.

4. Expand technical and financial support from agencies for the activities of local watershed groups.

5. Support basin trusts as a means of maximizing available funding for basin and watershed initiatives.

Elements of Integrated Governance

The Commission suggests the following as important elements of integrated basin and watershed governance.[1] Our emphasis is on the functions that must be accomplished, not the means to do so. Because each basin is different in its history, governing institutions, legal structures, and resource problems, various approaches for achieving these goals must be tried. Continued experimentation and evolution are encouraged. However, it is the Commission's belief that these governance efforts are evolving towards the following set of objectives:

(1) A new approach to governance based on hydrologic systems, linking basins and watersheds.

The federal resource agencies in the basin will adopt practices which encourage—through financial support, in-kind services, and cooperative interaction—the growth of collaborative watershed groups and initiatives on which all stakeholders are fairly represented.

The federal agencies will develop a cooperative process at the river basin level, utilizing entities where they exist and involving the leaders of federal, tribal, state, and local agencies; watershed council leaders; and other stakeholders as appropriate, created for the purpose of determining jointly supported solutions.

This cooperative process will provide for increased coordination among the federal regional offices in the basin and facilitate funding of programs proposed by watershed councils as well as the agencies. The President should issue an Executive order or memorandum/directive to the heads of federal agencies and Cabinet Secretaries to require regional and/or watershed level coordination of agency budget requests. Agency budget requests pertaining to water resource management and development shall be subject to mandatory review for interagency programmatic coordination and consistency. The designated water resource management officials performing these reviews shall be located in the particular region they serve.

(2) Basin-level objectives.

The river basin planning process will lead to the joint development of measurable objectives for the basin, which comply with federal, tribal, state, and local substantive law, that will be communicated to interested parties in the basin including watershed councils.

(3) A basin trust fund.

The process will encourage the formation of basin accounts and basin trusts which integrate federal, state, tribal, and local funds with money or in-kind contributions from nongovernmental sources such as foundations, stakeholders, and utilities to fund activities that support basin objectives; once a fund is established, a mechanism should be developed which will permit retention of these funds in an

[1] Several of these concepts are outlined in Hatfield, 1994.

interest-bearing reserve account or trust and facilitate carryover management of the funds on a sustained multiyear basis

These funds, which may include federal appropriations, state funds, and local contributions, will be distributed in an orderly and equitable manner, primarily at the watershed level to further established objectives for the basin.

(4) A link with watershed councils.

Watershed councils will develop plans and identify specific projects to accomplish their own unique local needs consistent with the objectives established in basin plans. No specific process or format should be required, in order to stimulate local innovation and flexibility; watershed councils will utilize integrated databases of federal agencies, state agencies, tribes, and other parties, as well as gather new information to establish baseline conditions and resources.

Watershed councils will provide a forum to educate stakeholders about applicable laws and requirements.

(5) A greater consistency of proposed projects with federal, state, and local laws and regulations.

Any project which is submitted by a watershed council to comply with the objectives set at the basin level shall be presumed consistent with prevailing law unless within 60 days found inconsistent by relevant authorities; this approach would be tested in pilot projects.

(6) A greater reliance on adaptive management.

There will be an orderly process for establishing baseline conditions and results of specific projects to document the achievement of objectives and to adjust the basin plan and objectives as appropriate.

These new governmental processes are already providing federal and state agencies, tribes, local agencies, and local organizations with tools to solve problems which, though complex at any level, are most effectively confronted by those in a position to observe the conditions directly. There may be a need for new federal authority to address the unique needs of these emerging governance structures, and it is the recommendation of the Commission that authority be given for pilot efforts to explore its full potential. It is hoped these ongoing efforts and future pilot projects will provide the Executive Branch and the Congress with invaluable empirical insights which maximize efficiency of federal expenditures, increase effectiveness of the administrative programs, and unify governmental actions to achieve federal goals.

Coordination of the Federal Agencies.—The Commission recommends two specific coordination strategies.

1. *Organization Around Basins and Watersheds*. Federal agencies with primary responsibility for managing water resources should be organized around river basins and watersheds to give focus to their programs and their interaction with citizens and other basin entities. Agencies should continue

Wherever Land Divides Us, Water Unites Us

How do we develop in a way that ensures the long-term health of our forests, soils, wildlife, rivers, and groundwater on which our lives, our jobs, and our spirits depend? Traditional land use decisions have not always dealt effectively with the balance between development and protection of our natural resources. Why not? Because development tends to be a reductive process; it subtracts land from the natural landscape and then divides it into mutually exclusive uses—roads, utility corridors, industrial parks, commercial office space, parking lots. In contrast, the natural landscape—with its complex living web between forests, watersheds, and wildlife—is an integrated whole, each piece dependent upon the others.

Our task as public officials is not to advocate one to the exclusion of the other but to seek balance, and to do so by looking at the entire landscape, even as you are called upon to make development decisions about specific parcels of land.

One of the most effective forces at drawing the connections between man and nature has been watershed councils; these councils are discovering how water connects us all. Watershed councils are bringing residents together to ask how we can develop in a way that maintains biological integrity of the whole and preserves open space for the spiritual needs of their communities. **#**

—Drawn from "*Wherever Land Divides Us, Water Unites Us*." Remarks of the Secretary of the Interior Bruce Babbitt to the National Association of Counties, Baltimore, MD, July 14, 1997.

their efforts to colocate or merge water-related operations and staffs to improve coordination and efficiency.

2. *Coordination of Programs and Budgets*. To the greatest extent practical, federal agencies should coordinate the programs and budgets which affect the management of river basins and watersheds to achieve efficiency of budget and effectiveness of programs. This can be done in several ways. The Commission recommends that agencies be directed to coordinate their budget submissions for those programs aimed at addressing river basin goals or on major species or ecosystem recovery efforts. The Commission further recommends that greater effort be made to more routinely coordinate and approve collective federal agency regional budget requests along river basin lines on an interagency basis, such as for the CALFED Bay-Delta Program, the Everglades Restoration Program, and the Chesapeake Bay Recovery Program. For additional recommendations on coordination of federal water-related programs and budgets, see recommendation 6, "Improving Decisionmaking, Reducing Conflict."

All agencies should develop or update comprehensive project plans that are consistent with and that support implementation of the basin plan.

Staffing and Budgeting for Local Consultation and Program Implementation.—The Commission recognizes and affirms the value of implementing programs and regulations through close collaboration with local groups and communities. Two important requirements for this must be noted:

1. Agencies should continue efforts they have made to staff and implement their programs locally. This important trend in how agencies work with the public is not inexpensive. Today, many, if not most, resource managers spend the majority of their time in consultation with the public, other agencies, and officials. The value of collaborative program implementation is achieved only if agencies maintain local offices with experienced staff possessing the skills to work on contentious issues with a diverse set of interests. Agencies must ensure that efforts to downsize and streamline government give priority to maintaining local staff capability. Also, greater flexibility must be available to local staff to effectively meet unique, site-specific needs.

2. Agencies must have the capability to provide assurance of long-term support of watershed groups and their projects, either through a long-term basin trust, multiyear budgets, revolving funds, or other innovative financing approaches.

2. Meeting Obligations to Tribes

Fulfill Trust Responsibilities

1. The federal government needs to fulfill its trust responsibilities to Indian tribes and nations to secure tribal water rights and assist the nations and tribes in putting those rights to use. Federal contributions toward meeting these obligations should not be limited to potential federal liability for breach of trust, but should recognize a moral and legal obligation to protect and assist the tribes. The federal government should recognize that it has often failed to protect prior and paramount Indian water rights while encouraging and financing non-Indian water development.

2. The federal government needs to fulfill its responsibility to assist Indian tribes and nations in managing and regulating tribal water resources and to exercise its trust responsibility to protect tribal uses of their water. Federal funding for this purpose should be increased. Federal efforts supporting development of tribal water codes should be increased.

3. The federal government needs to continue recognition of the role of tribal governments in setting water quality standards on reservations. Tribal treatment activities under the Clean Water Act should continue, and federal funding for the tribes to carry out the Clean Water Act should be increased.

4. The Congress should expand the Leavitt Act to defer repayment on capital costs for all water resource construction on Indian reservations instead of deferring it only for irrigation facilities. Such a change would be helpful in constructing municipal and industrial systems for tribes.

5. The Secretary of the Interior, in fulfillment of his trust responsibilities, should identify potential funding sources for hydrological studies for balancing water demands on a basinwide basis. General studies to document basinwide sources and needs would serve to allow the Secretary to evaluate the needs for structural or operational conservation measures and would be useful in reconciling Indian water claims and putting Indian water rights to beneficial use.

6. It is estimated that there are approximately 1 million acres of Bureau of Indian Affairs (BIA) irrigation project lands on reservations, of which approximately 750,000 acres are irrigated on an average annual basis. Up to 400,000 additional nonproject acres are irrigated. On average, tribal irrigation projects have a water delivery efficiency of approximately 15 percent. Reasonable improvements in the water delivery systems could achieve 50-percent project efficiencies in many cases, saving more than 1 million acre-feet of water for other tribal uses. The Secretary of the Interior should bring the department's resources and expertise to bear to evaluate and pursue such efficiency improvements (Olinger, 1997).

7. The Congress should appropriate funds and authorize the development of water supply and sanitation systems to ensure that residents of reservations have sufficient potable water and modern sewage treatment facilities to maintain the public health and protect the environment.

8. As the Administration and the Congress consider a new small project loan program for the Bureau of Reclamation (Reclamation), provisions for investment in tribal irrigation and municipal water systems should be provided.

Resolve Indian Water Rights Claims

1. The federal government should increase its budget and use other federal resources to fully implement existing Indian water rights settlements and negotiate new Indian water rights settlements. Indian water marketing, hydropower revenues, and Reclamation funds should be used to facilitate Indian water rights settlements. The Congress should support these activities with additional appropriations.

2. The federal government should increase its budget and staff for negotiating and litigating Indian water rights claims. Funds also should be increased to allow greater tribal participation in negotiations and litigation of their claims. The Congress should support these activities with additional appropriations.

3. The federal government needs to improve the federal negotiation team process to facilitate more Indian water rights settlements. The process should be streamlined to provide the teams with authority to commit the federal government in a timely fashion.

4. The federal government should clarify federal policy regarding marketing of Indian water. Allowing water entitlements of Indian reservations

to be leased with no more restrictions than non-Indian rights would facilitate greater efficiencies and flexibility of water use.

Basin and Watershed Governance

In recognition of their sovereign status as governments, all recognized nations and tribes should be included, along with the federal and state governments, in any new basin and watershed governance structures affecting tribal assets.

3. Resources Management and Restoration

Protecting and Restoring the Environment, Including Aquatic Ecosystems and Water Quality

A number of reports prepared for consideration by the Commission and, in particular, the proceedings of the Aquatic Ecosystems Symposium held in February 1997, led the Commission to finding that many "Aquatic systems in the American West are broken and must soon be fixed if they are to again be sustainable" (Mickey, 1997; NRC, 1992a). By "fixing" aquatic ecosystems, the Commission does not mean returning these systems to predisturbance or predevelopment conditions; rather, the Commission's overall goal is to restore the systems so that important functions can be recovered and benefits can be realized and sustained over time.[2]

1. Many aquatic ecosystems are significantly impacted, and a number of actions, particularly at the federal level, need to be taken to restore these ecosystems (Mickey, 1997).[3]

Examples of the impacts include:

- More than 20 native fishes have become extinct in the past century.
- 57 percent of freshwater native fishes in California have become extinct or are in need of immediate attention.
- 214 anadromous salmon and trout species in California, Idaho, Oregon, and Washington are in need of special management because of declining numbers, and 101 of these are at high risk of extinction (Forest Ecosystem Management Assessment Team, 1993).
- Of the 3.25 million stream miles in the lower 48 states, less than 2 percent are of "high" natural quality.
- Instream flows in the Rio Grande, Upper Colorado, and Lower Colorado water resource regions are insufficient to meet current needs for wildlife and fish habitat.
- Of the 123 million acres of wetlands remaining in the lower 48 states, a net 80,000 acres are lost annually. A total of 94 million acres (44 percent) of the wetlands existing in the lower 48 states have been lost in the last 200 years. (See Agricultural Resources and Environmental Indicators 1996-97 (1997), tables 6.5.1 and 6.5.2.).

[2] It should be noted that the Clean Water Act states, "The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters."

[3] The Commission also used the National Research Council report, *Restoration of Aquatic Ecosystems*, National Academy Press, 1992, for reference and encourages the Administration and the Congress to carefully review this document and take appropriate actions based upon the recommendations of this report.

2. Current water management practices and decisions affecting numerous aquatic systems are not sustainable.

3. Without renewed efforts to protect existing healthy systems and restore degraded systems, present conditions will worsen due, in part, to population growth, climate changes, declining water quality, overappropriation of water supply, overdrafting of groundwater, flood plain management, land use practices, and other factors.

4. Aquatic ecosystems provide critical benefits for human, plant, and animal life, including improving water quality, reducing erosion and sediment losses, providing habitat (which more than 75 percent of the animal species in arid regions need), creating recreation benefits and other amenities for growing populations, and providing flood control benefits.

5. The Commission notes that, in general, federal environmental laws such as the ESA and the Clean Water Act have played important roles in protecting and, in some cases, requiring the restoration of, aquatic ecosystems. While some changes may be necessary to improve the implementation of these laws, the Commission believes these laws continue to be important in ensuring that aquatic and other ecosystems are protected and in setting the parameters within which locally driven watershed initiatives operate.

Federal Agency Plans and Activities

The Commission found that aquatic ecosystems are under stress from a variety of sources, some of which are directly caused by federal projects and activities. Federal agencies have begun implementing measures to mitigate impacts associated with their projects and activities. However, in many instances, these mitigation measures have not been sufficient, and federal agencies will have to exert greater effort, in concert with others, to restore and sustain the health, productivity, and biological diversity of aquatic ecosystems.

To accomplish this, the Commission recommends that federal agencies develop and implement comprehensive project plans for aquatic ecosystem restoration and protection, coordinate their activities closely with each other, and incorporate the following measurable goals into such plans and activities:

1. Improve water quality in western waterways to meet state water quality standards and effluent limits and to support designated uses established by states and tribes (such as swimming, fishing, and support of aquatic life). Programs and strategies should be developed to address specific problems such as salinity, sediment loadings, temperature, and toxic contaminants. Where such programs already exist, agencies should reevaluate them and ensure that they include measurable goals, performance indicators, and a timeframe for resolving the problems.

2. Recover and protect threatened and endangered aquatic species and other species at risk by developing multispecies habitat conservation programs, where appropriate, in partnerships with other federal and state agencies, tribes, and private entities.

3. Specifically recognize the benefits of conserving native species, communities, and ecosystems and take steps to sustain native species through activities and programs which will maintain, restore, and enhance instream, riparian, and upland habitat and wetlands, and which will remove barriers to fish migration, spawning, and rearing. Such actions can potentially prevent additional listings under ESA.

4. Provide instream flows (pattern and volume of water) to achieve and protect the natural functions

of the riverine, riparian, and flood plain ecosystems. Operations of federal (primarily Reclamation and the Corps of Engineers [Corps]) reservoirs, as well as voluntary water transfers, can play a significant role in achieving this goal.

5. Eradicate and control the spread of exotic and non-native species and pests (e.g., zebra mussels, purple loosestrife) by establishing monitoring, inspection, eradication, and public education programs, including research in cooperation with other entities.

6. Identify and restore contaminated sites that are degrading aquatic ecosystems. Many of these occur on Forest Service or Bureau of Land Management (BLM) managed lands.

These activities should be an integral part of a basin plan whenever such plans are developed.

Establishing Environmental Restoration as a Priority

The Commission recognizes that the federal government has taken actions which have resulted in significant alteration of water quality or water-dependent ecosystems and that it, therefore, has an obligation to address the changes it has directly caused. Further, restoration of these water-dependent ecosystems can have important national benefits. Therefore, the Congress and the Administration should take steps to establish a clear federal policy of environmental restoration to address impacts from past and present programs and from federally owned or permitted facilities. Possible specific mechanisms include:

1. Develop a national aquatic ecosystem restoration strategy consistent with the recommendations of the National Research Council's (NCR) 1992 report, *Restoration of Aquatic Ecosystems*.[4]

2. Explicitly authorize Reclamation (as it has with the Corps) to include environmental restoration as a purpose of all of their projects and provide for funding and cost sharing for such activities.[5]

3. Require environmental impacts to be evaluated, and costs for restoration included in determining a project's true costs and benefits (both future and current).

4. Require projects to be operated and maintained to mitigate existing environmental impacts, even when such action may reduce other project benefits, and to address additional mitigation measures required to correct the full range of environmental impacts as part of the assessment recommended in the section, "Operation of Dams and Water Delivery Systems" later in this chapter.

5. Manage water resources and water projects in a manner that recognizes the benefits to be accrued from conserving native species, communities, and ecosystems.

6. Fund programs that address environmental management, protection, and restoration issues on a watershed basis, such as the Environmental

[4] The 1992 NRC report listed four elements critical to a national strategy: (1) national restoration goals, (2) principles for priority setting and policymaking, (3) policy and program redesign for federal agencies, and (4) innovation in financing and in use of land and water markets.

[5] Reclamation identified "lack of broad authority to undertake ecosystem management activities" as a constraint to its ability to broaden its aquatic ecosystem protection and enhancement activities (Reclamation, 1997a).

Protection Agency (EPA) Watershed Protection Initiative or the Bay-Delta process, with emphasis on stressed western rivers.

7. Encourage further recognition by states of beneficial use of water instream as an eligible water right.

Integrate Land and Water Management Agencies' Activities

There is a growing understanding of the interrelationship between land-based activities that take place in the watershed and the quantity and quality of water in associated streams and rivers. It is this understanding that has motivated resource managers to move toward more holistic management approaches such as integrated resource management, watershed management, or ecosystem management. Given the interconnectedness of land activities and natural water systems, the Commission believes that federal land and water management agencies should ensure that their programs and activities are managed by taking into account how they may impact water resources and aquatic systems, both individually and cumulatively with other activities occurring in the watershed. In addition, the need to improve our approach to flood mitigation through land-management activities, as well as water resources programs, creates the opportunity to protect and restore riparian, riverine, and watershed areas. The benefits of such activities include both a reduction in flood-related losses and also the potential for environmental improvements, including both water quality and water supply.

Given these understandings and objectives, the Commission recommends the following:

1. The Administration and the Congress should carefully review and take steps to implement the recommendations, as appropriate, of the *Interagency Floodplain Management Review Committee* (1994; also called the Galloway Report), the 1992 Report of the National Research Council on restoring aquatic ecosystems, and the recommendations of the scientific panels at the Aquatic Ecosystem Symposium sponsored by the Commission, which include:

(a) Encouraging federal agencies, through development of an Executive order or ecosystem restoration statute, to

(i) Coordinate activities across agency and program lines consistent with hydrologic units, such as river basins and watersheds.

(ii) Conduct federal programs according to the best available science of ecosystem management and adaptive management principles.

(iii) Put the ecosystems restoration approach at least on a par with other approaches to implementing their agency programs.[6]

2. Federal land management agencies should institute forest, grazing, gas and oil exploration, and mining management practices that conserve and sustain river, riparian, and flood plain ecosystems, including establishing riparian habitat management areas to apply to all streams large enough to provide

[6] The Commission recognizes that the recommendation in (1) would require significant changes in federal agencies' programs. Accordingly, the Commission suggests that this sort of coordinated ecosystem management be carried out in pilot projects, perhaps projects which correspond to the units established under the governance proposals.

long-term stream ecosystem functions and designing key watersheds to be managed to conserve aquatic biodiversity.[7]

3. Land use policies should be adopted within federal agencies' jurisdictions that acknowledge the value of and require, as appropriate, riparian buffers for the maintenance and/or restoration of healthy aquatic ecosystems.[8]

4. Sources of unnatural sedimentation throughout federally managed portions of watersheds should be minimized, and future sources of unnatural sedimentation should be prevented, by protecting roadless areas and steep, unstable slopes from various management activities. In areas where timber production activities contribute significantly to stream-degrading sediment loading, inventories should be conducted to classify and map unstable and potentially unstable lands and withdraw them from timber production.

5. The Commission also acknowledges the need for certain federally reserved or public lands to have allocated quantities of water of specified quality, timing, and duration to meet designated public purposes. Federal land management agencies should proceed to assert and quantify federal reserved water rights, to appropriate water under state law, and to seek negotiated solutions with other water users for meeting those rights.

Support for Aquatic Science and Research

1. *Science-Based Decisionmaking*. Federal agencies should base their programs on the best available science. A number of specific recommendations are included in this report to improve data collection, information sharing, and peer review processes of the agencies. (See recommendation 6, "Improving Decisionmaking, Reducing Conflict.") Further, the Commission recommends that the Administration and the Congress carefully review the proceedings and the recommendations from the Aquatic Ecosystem Symposium sponsored by the Commission in February, the Galloway Report, and the National Research Council report on restoring aquatic ecosystems (Minckley, 1997; Interagency Floodplain Management Review Committee, 1994; NRC, 1992a) and implement as appropriate.

2. *Science to Improve Decisionmaking*. The Department of the Interior should request, and the Congress should appropriate, sufficient funds to strengthen the U.S. Geological Survey (USGS) biological and hydrologic research programs needed to improve the understanding of how aquatic ecosystems function. Such investigations

[7] An aquatic conservation strategy was developed for the Pacific Northwest as part of the Forest Ecosystem Management Assessment Team (FEMAT) investigation. This strategy included "riparian reserves, habitat restoration, and monitoring
built around a system of drainages called 'key watersheds." The key watersheds are in generally good condition and are to be managed primarily for aquatic resources. See *Habitat Policy for Salmon in the Pacific Northwest* by James R. Sedell, Gordon H. Reeves, and Peter A. Bisson, *Pacific Salmon & Their Ecosystems*, Chapman and Hall, 1997, and the 1993 FEMAT Report.

[8] The Commission recognizes that the buffer zones will vary according to the location, size, function, and coordination of the waterway; the aquatic species present; the future desired condi-tion; and other factors. It is the Commission's expectation that such zones (and the width of such zones and the activities per-mitted in them) will be established in a scientifically sound manner. The Aquatic/Watershed Group of FEMAT developed an aquatic ecosystem strategy which sought to restore habitat and prevent further degradation over large landscapes. The Commission recommends that the experiences, expertise, and methodologies used by these scientists be reviewed and used as appropriate in other areas. See *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*, July 1993, for strategy and quantifiable objectives.

should be directed toward the knowledge needed to advance restoration and management of watersheds and river basins.[9]

Funding Mechanisms

1. Adequate funding is required to meet environmental restoration needs; innovative funding mechanisms are necessary to meet overall funding requirements. The Administration and the Congress should take steps to:

(a) Allow and encourage federal agencies to pool funds to maximize total available funding for projects and provide greater flexibility. The Administration should take steps to ensure that agencies coordinate allocating and expending funds on restoration activities, as well as establishing priorities for spending funds. The Commission strongly believes that interagency budget coordination is necessary to maximize the effective expenditure of shrinking federal funds, to eliminate duplication, and to ensure the funds are spent on the high priority activities.

(b) Lift restrictions on use of federal funds on nonfederal lands as appropriate.

(c) Grant agencies carryover authority to enable spending on long-term projects and/or provide for multiyear funding of activities.[10] When a fund fueled by user-based and/or congressional appropriations is established to facilitate a basin program, we recommend passage of waivers or exemptions which will permit retention of funds in an interest-bearing reserve account or trust to facilitate carryover management of the funds on a sustained multiyear basis.

(d) Authorize federal agencies to spend money on nontraditional ways to encourage sustainable water development and management, including buying water for instream flows, buying conservation easements, and funding aquifer storage, reuse, and conservation projects, as well as other methods to achieve restoration and water supply goals.

(e) Apply the principle of "user pays" by charging the true costs of extractive uses of renewable and nonrenewable resources.

(f) The Administration should actively explore other innovative funding mechanisms, such as trust funds, private-partnership arrangements, and foundations, to create opportunities to raise and direct nonfederal dollars to restoration projects.

(g) Authorize federal loan and grant programs to assist states and others in carrying out ecosystem restoration projects.

(h) Amend the Land and Water Conservation Fund to permit both state and local grant recipients and federal agency participants to use fund money to acquire water for environmental protection and mitigation.

[9] The Commission recognizes that water management agencies have research arms. It is the Commission's expectation that this research will be coordinated with USGS work and not be duplicative**.** The Administration should specify a lead agency to coordinate research activities within a watershed to ensure that a comprehensive, rather than piecemeal, approach is used to gain a better understanding of how aquatic and other ecosystems work. The present approach of each agency appears to the Commission to be fragmented and not conducive to ecosystem management.

[10] In its report to the Commission, Reclamation notes that the lack of multiyear funding for planning and monitoring inhibits its ability to develop and implement plans to protect and enhance aquatic ecosystems.

Water Quality

The federal government has, for well over 30 years, taken the policy lead in water pollution control, largely because the issue is national and even international in scope and bears heavily on the national economy and society. Implementation of federal clean water laws has been remarkably successful in many areas, particularly in reduction and control of point source pollutants. The federal government should continue to provide strong leadership in water quality protection for the same reasons which led the Congress to enact the CWA in 1972. A sufficient supply of clean water is necessary for the health and well-being of people and of ecosystems. It is essential for our economic security and the sustainability of agricultural and municipal systems.

However, the leading objective of the CWA—"to restore and maintain the chemical, physical, and biological integrity of the nation's waters"—remains unfulfilled. Despite progress in many important areas, significant problems remain to be addressed. These include: (a) nonpoint source runoff and discharges; (b) poor integration of land and water management; (c) inadequate management of some specific sources of water quality impairment; (d) inadequate water quality standards for some aspects of water quality; (e) poor integration of groundwater and surface water pollution control programs; (f) poor coordination of water quality and water use programs; and (g) insufficient attention to more holistic and integrated approaches to water quality protection and improvement.

When actions of federal agencies have led to deterioration of water quality or water-dependent ecosystems, the agencies should assume the affirmative obligation of restoration.

Water Quality Standards.—

1. The water quality of western rivers presents issues that are often different from those in the eastern United States. There is little recognition of this in CWA or in the programs of EPA. EPA should, within the parameters of its statutory authority, be an active player in protecting and restoring western waters. Water quality standards, which are established by the states, should reflect the ecological attributes of rivers, as well as their chemical composition.

2. EPA and USGS should broaden their water quality monitoring to enable the agencies to knowledgeably assess the condition of western ecosystems.

3. Western ephemeral streams in arid areas, dry many months of the year, with aquatic ecosystems that can be vastly different from year-round water bodies, present a unique challenge under CWA. The Commission supports EPA's effort to find ways to treat these aquatic ecosystems as a separate type of water use and to develop a more appropriate, though equally protective, set of water quality criteria that states may use to adopt water quality standards that protect these ecosystems and their species and habitats. EPA and the states should be responsive to the growing pressure in the West to move toward land application of effluent, rather than costly treatment. In the West, the ecological value of water in streams is often higher than no discharge of effluent. The Commission also supports EPA's efforts to encourage states to develop biological criteria to help define the biological integrity of state waters.

4. Hydrologic modification activities are increasingly a source of concern in western aquatic ecosystems and rank third nationally as a source of water quality impairment for rivers. Water quality criteria and best management practices should be aggressively developed that allow states to pursue

instream flow and other standards for protecting physical and biological aspects of instream water quality.

Nonpoint Sources of Pollution.—

1. Pollution from diffuse sources reaches surface water and groundwater through overland runoff, washout from the atmosphere, leaching into groundwater, and other means, and is particularly difficult to control. A comprehensive collection of statistics, surveys, and studies examined by the Commission supports a conclusion that the West will not achieve water quality objectives—let alone sustainability of watersheds—unless there is a substantial new commitment to, and improvement in, policies and programs to reduce and control water pollution from surface runoff and other nonpoint sources. Nonpoint source agricultural pollution consistently stands out as a major source of water quality impairment throughout much of the West (EPA, 1995; USGS, 1993; National Water Summary, 1990-91).

Despite extensive program efforts and expenditures under the voluntary programs of CWA and the farm bills, and establishment of soil loss limits by the Natural Resources Conservation Service (NRCS), the problem of nonpoint source degradation continues and threatens to undermine the considerable national success in addressing point sources of water pollution (Reetz, 1997). Clearly, efforts to date have been inadequate to achieve fully the fundamental objectives of CWA.

2. Federal policy and law should continue to address nonpoint sources of water quality degradation through nationally consistent programs and by establishing national benchmarks for water quality and for best management practices. Federal programs must be reassessed, given the limited success to date in reducing many categories of nonpoint sources that contribute to water quality impairment. Programs must also be implemented more aggressively by states with active support and cooperation of the federal government.

3. Programs addressing nonpoint sources should, wherever feasible, emphasize incentives to adopt best land management practices and be designed to be implemented flexibly at the watershed level. Many nonpoint source problems are site specific, and proposed solutions must be sufficiently flexible to reflect local physical and economic circumstances in a given watershed. Innovation should be encouraged as local and watershed solutions are proposed.

Examples of incentive-based programs include the Conservation Reserve Program and the Emergency Watershed Program, with its emphasis on flood plain easements and similar devices. Cost sharing of the type once used in the Great Plains Conservation Program should be made available westwide.

Nonpoint source programs should, wherever possible, be implemented through local watershed organizations. In developing local solutions, close attention should be given to the views of individuals who know the particular land well, such as long-term residents and those who farm, ranch, and fish.

4. The Congress should consider modifying or changing the CWA approach to nonpoint sources found in Sections 208 and 319 to that of the Coastal Zone Management Act (16 U.S.C. § 1451 et. seq.) reauthorization amendments.

5. The EPA and the states should more actively pursue cooperative implementation of the watershed-based total maximum daily load (TMDL) process. The states and the federal government have moved slowly to implement this potentially effective tool. The TMDL process also provides a vehicle for working closely with local interests such as watershed councils. Since the TMDL process

primarily is a tool for identifying the pollution load a receiving body can assimilate, it requires a successful implementing program to actually reduce pollution from nonpoint sources. Two promising areas are a reformed system of nonpoint source best management practices, described above, and pollutant trading systems developed on a watershed basis.

Integrating Land and Water Quality Management.—Many nonpoint and diffuse sources of pollution are the result of land management practices undertaken for a variety of purposes. The federal government is a substantial land and water manager in the West, and therefore has important obligations in this area.

1. The mission and authority of each federal water and land management agency, including the Corps, Reclamation, Forest Service, BLM, Fish and Wildlife Service (Service), and National Park Service (NPS) should explicitly include land management to improve water quality, particularly from nonpoint sources. The federal government should consider how it can best meet its water quality obligations under CWA and implement CWA "federal consistency" provisions. Federal agencies should be held to the same water quality standards as others. However, the absence of state controls on nonpoint source pollution has allowed federal managers to avoid complying with these standards. The Congress should mandate, for example, that the Forest Service and BLM implement best land management practices on public land to meet water quality standards.

2. In some river basins, irrigation of marginal agricultural lands results in excessive salts, as well as selenium and other toxic constituents, in return flows from some types of soils. In such situations, restoration and pollutant reduction options should be aggressively implemented. These options can range from more efficient water use and other irrigation management techniques, as documented in studies done in the Central Valley of California, to considering retirement of marginal lands as cost-effective approaches to meeting water quality standards in particular situations.

3. The Commission observes that there is frequently a direct and significant correlation between nonpoint source pollution, wetland drainage, and flooding: each is often the result of shortsighted land management practices. On these subjects, the finding of the National Water Commission again continues to have force: flooding and water pollution are closely connected to land use and management; federal water policy must focus, inevitably, where land meets water. Protecting and restoring natural flood plains and wetlands should be promoted as a critical component for managing water quality on a watershed basis as well as for the other public and private benefits flood plains and wetlands can provide.

Specific Sources of Water Quality Impairment.—

1. A historic pattern of general growth, urbanization, and population concentration is accelerating at an unparalleled rate in the West. It is, and will continue to be, a serious threat to water quality. It has also been regarded as somehow an uncontrollable source of water quality degradation. Yet mechanisms may exist that could be more fully employed to help reach water quality goals.

For example, discharges from publicly owned wastewater treatment works that are utilized beyond their capacity are a potential cause of water quality impairment in specific western water bodies. The states and EPA should carefully monitor the water quality impacts of growth in the West and assure, for example, that growth does not outstrip current and future waste treatment capacity and adversely affect receiving waters.

2. The CWA exempts several important point sources from effluent limitations and regulation

under the point source National Pollution Discharge Elimination System (NPDES) permit system. As a result, some significant sources of water quality degradation need to be addressed and are not.

Among the most serious unregulated forms of water pollution is that generated by irrigated agriculture through irrigation and drainage districts. Irrigation return flows can, in certain situations, contain toxic constituents as well as salts, pesticides, and fertilizers. Some of these discharges enter waterways through discrete and specific points—pipes and ditches—after being collected in carefully engineered systems. These discharges, which are point source in nature, were exempted by the Congress through an amendment to the Clean Water Act; that exemption should be reconsidered. Other irrigated agricultural return flows are much more diffuse in nature. Often, the two are found together on one field, complicating their management.

Still, there is a well-known and broadly understood science and technology for control of both point and diffuse water pollution from such sources. More rigorous control of these sources should be tied to best land and water management practices—careful definition of effluent and instream water quality standards, soil loss limits, water efficiency measures, and preparation of whole-farm conservation plans as defined by NRCS. The interaction of point discharges with overland runoff and underground seepage should be considered in developing and implementing a combination of point source requirements, enforceable nonpoint source requirements, and instream standards.

3. The large and growing number of sizeable confined animal feeding operations will continue to represent an ever-increasing threat to surface and groundwater quality. Under CWA, most such lots are point sources in the technical sense only but are largely treated as exempt from regulation in the practical sense. CWA authorities should be applied to require that confined animal feeding operations operate under NPDES permits that are enforced.

Groundwater-Surface Water Linkage.—Increasingly, empirical studies have documented that groundwater and surface water are not separate and distinct hydrologic regimes in terms of water quality or water quantity.

The CWA and other federal and state laws needlessly perpetuate this fictional division, resulting in inefficient pollution control.

Because of the hydrologic link between surface and groundwater, the discharge of pollutants into groundwater from a wide range of sources should be subject to some rigorous system of management under CWA, through NPDES, nonpoint source best management practices, or watershed management approaches. Safe Drinking Water Act protections for groundwater as a source of human drinking water do not currently assure water quality protection.

Water Use and Water Quality Linkage.—

1. The Commission joins with many other voices in noting that water quality and water use systems are not integrated or effectively coordinated at the federal, state, or local level. Fulfilling the mandate of CWA to protect physical and biological, as well as chemical, water quality is difficult if not impossible without this coordination. Even though it presents challenges in accommodating water quality goals and water quantity needs, the relationships between water use (water allocation and water rights) decisions and water quality management should be recognized at all levels of government decisionmaking.

2. Federal agencies with water management responsibilities should recognize that storage and offstream diversions for water use can have a locally

significant adverse effect on instream water quality in western states. Federal agencies with responsibility for dam and reservoir operation and control should include water quality protection as one of their principal management goals. Also, the contribution of such cost-effective water management tools as improved water use efficiency into water quality improvement efforts deserves more attention. The refocusing of the Colorado Salinity Control Program on nonstructural solutions is just one example of this.

3. Monitoring of water quality and water quantity should be given the highest priority. The principal recommendations of the Intergovernmental Task Force on Monitoring Water Quality should be implemented. These call for the establishment of a National Water Quality Monitoring Council, use of collaborative monitoring teams, and linking national ambient water-quality assessment programs.

Irrigation Drainage and Retirement of Lands Unsuitable for Irrigation.—Reclamation should document, on a project-by-project basis, the water quality effects of each of its projects providing irrigation water service. Reclamation should then prepare a plan for each project for addressing water quality impacts on a long-term basis, meeting applicable state and federal water quality standards and restoring aquatic resources that have been damaged or degraded by contaminated irrigation drainage. Such plans should consider a range of remediation approaches including treatment, source reduction, and land retirement.

The Congress should prohibit Reclamation from conveying certain new benefits from the Reclamation program (e.g., new contracts, contract renewals, or extensions; early payouts; rehabilitation of project facilities; loans, etc.) for any project that has not taken steps to address the impacts of agricultural drainage water.

Integrated Watershed Solutions.—In conclusion, to further the goals of CWA to promote the physical, chemical, and biological integrity of our nation's waters, and to meet the national goals of fishable and swimmable waters, integrated solutions beyond the bounds of the current CWA programs are needed. The Commission endorses more widespread adoption of watershed-based efforts to achieve improved water quality and urges the cooperation of federal, state, tribal, and other entities in achieving these goals. The Commission also points to the importance of overall water quality improvement, not just reduction of specific pollutants, as a key factor in restoration of western aquatic ecosystems and endorses the recommendations of the National Research Council 1992 report on aquatic ecosystems (NRC, 1992a).

4. Management of Water and Water Facilities

Modifying Operation of Existing Federal Projects to Better Address Current and Future Needs

The growing population of the West and the increasing demands for instream uses suggest that we must continue to look for ways to expand the managed water supply.

New Storage.—Water supplies in the West will need to be augmented by new storage in some areas to address tribal water rights, instream needs, and out-of-stream uses. Strategic storage augmentation should focus on a range of new approaches that have fewer environmental impacts and are cost effective, including smaller and offstream storage facilities, pumped storage, and groundwater recharge. It appears that most new storage in the West is being undertaken by states and local water utilities. (See report to the Commission by the Western States Water Council, *Water in the West Today: A States' Perspective*,

July 1997). However, as part of the review of operations of federal dams, consideration should be given to the need for additional supplies and opportunities for improving project yield, such as through changes in dam operating criteria, expansion of storage, and the like.

One new water supply strategy presented to the Commission is headwater storage. This entails development of smaller offstream storage facilities high in a watershed to augment existing demands and to meet new demands. This strategy provides several advantages over large basin storage facilities. Being high in the system, it allows greater operational flexibility and less evaporation loss. Since it is offstream, it may have less adverse impact on the stream. As with all new storage, it is relatively expensive and has some unavoidable environmental effects.

The emerging trend is for state and private agencies to take the lead in developing new storage for municipal supplies. For example, the Metropolitan Water District (MWD) of Southern California is completing the $1.9 billion Eastside Reservoir Project, including the 800,000-acre-foot Eastside Reservoir, which will provide a 6-month emergency supply to MWD's service area and a regulated supply to help meet an additional 1.2-million-acre-foot demand in southern California by the year 2030 (MWD, 1997). The Contra Costa Water District's Los Vaqueros Project, which includes the 100,000-acre-foot Los Vaqueros Reservoir, is being constructed at a cost of nearly $450 million and will principally improve water supply reliability and quality from the Sacramento-San Joaquin Delta (State of California, 1994).

For federal projects, the trend appears to be toward augmenting supplies for multiple purposes, but usually with the core purpose of addressing endangered species issues or tribal water rights. Current examples are the Animas-La Plata Project in southwestern Colorado, which would implement a tribal water right settlement; the storage options being considered as part of the Bay-Delta program to augment supplies to replace waters recently dedicated to environmental purposes; and the enlargement of Pathfinder Reservoir in Wyoming, in part, to provide additional water for meeting endangered species needs along the Platte River in Nebraska.

Water Reuse and Recycling.—

Throughout the West, interest in water recycling, reclamation, and reuse as a way to stretch available water supplies is strong and increasing. In conjunction with more efficient water use, in many areas, this may be the only available source of "new" water.

The Commission recommends that the federal government undertake a role of strong support for local water recycling projects. This would include:

- Demonstration, technology development, and research.
- Definition of water quality parameters.
- Technical and financial assistance for particular projects.
- Efforts to reduce the institutional and regulatory barriers to water recycling. In particular, the Congress should provide funds for Interior to develop a westwide program to promote water recycling where it is environmentally and economically appropriate and to identify on a regional basis the feasibility of water recycling to meet water supply needs.

At the same time, recognizing that there are many worthwhile projects from a local point of view and a diminishing source of federal funds, the Commission urges the federal government to invest only in those projects that assist the federal government in

meeting its own water resources management mission including environmental mitigation and restoration. Federal agencies should work closely together and with individual states to coordinate financial assistance programs to leverage federal dollars.

Optimization of River Systems.— Agencies should continue to study approaches to optimize yield from operation of reservoirs and systems of reservoirs. Conjunctive use of ground and surface supplies, and keeping more water stored at higher elevations, can improve yield.

Risk Sharing and Management.— Especially as the capacities of current storage systems are reached, mechanisms for sharing risk of shortages can allow critical needs to be met from existing supplies. Urban rationing plans and agricultural water banks are two such approaches that should be further used.

Groundwater Management.—State law should recognize and take account of the substantial interrelationship of surface water and groundwater. Rights in both sources of supply should be integrated, and uses should be administered and managed conjunctively. The Congress should require state management of groundwater and regulation of withdrawals as a condition of federal financial assistance for construction of new water storage projects.

All federal agencies conducting water planning should include in studies and proposals a description of associated groundwater resources and their current management, including estimates of the rates of depletion of such resources. The Congress should scrutinize proposals for water projects in areas with groundwater mining, especially noting the presence or absence of groundwater regulation and management.

Drought Management.—Drought is one of the most costly western water problems. It also has one of the most predictable patterns of occurrence of all natural disasters. Unfortunately, drought management remains too often on a crisis-management rather than a risk-management basis. The Commission adopts the following recommendations based upon the review of drought management and drought policy conducted for the Commission (Wilhite, 1997). These recommendations are similar to those recently adopted by the Western Governors' Association in 1996, which the Commission endorses (Western Governors' Association, 1996a).

1. An interagency task force should be established to develop an integrated national drought policy and plan that emphasize a preventive, anticipatory, risk management approach to drought management and promotes self-reliance. An effort to better coordinate existing programs and mitigation activities has been initiated for the western United States by a memorandum of understanding among the U.S. Department of Agriculture (USDA), Interior, the Federal Emergency Management Agency (FEMA), the Department of the Army, the Department of Commerce, three tribal councils, the National Association of Counties, and the Western Governors' Association.

2. Drought management should be incorporated into FEMA's National Mitigation Strategy.

3. An improved system should be developed for national climate monitoring that builds upon the various drought monitoring systems developed by states. The goal is to provide early warning of emerging drought conditions.

4. Most, but not all, western states have developed drought mitigation plans. The federal government should provide technical assistance and financial incentives to develop or revise existing plans.

5. All federal and state drought management should emphasize programs that encourage long-range planning and mitigation for drought and that provide more timely and reliable information to decisionmakers.

Rural Domestic Water Supplies.—It should be a goal of the federal government to ensure that all residents of tribal reservations have safe and modern water supply, treatment, and sanitation facilities. Further, state and federal agencies should continue efforts to assist rural communities to develop or upgrade their water supply and treatment systems to meet drinking water standards and to make operation of these systems more cost effective. For both of these purposes, reallocation of water supplies from existing federal water projects should be considered if appropriate.

Promoting Efficiency and Flexibility of Water Use

Water Conservation and Efficiency.—Water conservation, or improved efficiency of use, can have many benefits and should be the first approach considered for extending or augmenting available supplies. Under the right conditions, it can help reduce stream diversions, reduce costs for water and wastewater treatment, reduce the need for new storage and delivery systems, and save costs for water users. However, the Commission recognizes that improving water use efficiency must always be viewed as a means to an end. Efficiency improvement programs must always have clearly defined purposes and must be structured to ensure that those purposes are achieved.

Water conservation programs in the municipal and industrial sector, where costs of water and treatment are high, have been successful at reducing use, sometimes dramatically. Ongoing programs have reduced water use by 15 percent, and emergency programs during drought have cut use by up to 50 percent. Sustaining large reductions is more difficult, and water utilities have limited incentives to significantly reduce customer demand in the long term (Natural Resources Law Center, 1997).

In the agricultural sector, numerous potential benefits come from improving water use efficiency. Benefits include reduced operating costs, onfarm costs, drought impacts, soil erosion, drainage problems, groundwater overdraft, and improved crop yields and quality and water supply reliability, as well as improved water quality and aquatic habitat.

Some of the constraints on water conservation in the agricultural sector are the low cost of water, the cost of conservation technologies, uncertainties about both the ownership of conserved water and the effects of conservation on individual water rights, and legal constraints on marketing conserved waters. Further, the relationship between improved water use efficiency by individual farmers and the resulting changes in river diversions for an irrigation project or watershed are complex and indirect, affected by both the specific nature of local water rights and basin hydrology. To be effective in meeting program goals, water efficiency improvements must be carefully planned and implemented with full understanding of the institutional and physical environment (Allen et al., 1996).

Estimating potential benefits to be gained from agricultural water conservation is difficult. Data on the effectiveness of efficiency programs are scarce, and specific sites can vary substantially in their potential for water conservation. Two studies of water conservation in Colorado and California from a decade ago estimated that somewhat less than 5 percent of total water use can be saved through practical agricultural conservation methods (Jenson, 1984; Davenport and Hagan, 1982). The National Research Council explains that, while increasing irrigation efficiency can reduce the amount of water diverted, the return flows will be decreased because

"conserved" water is often used elsewhere on the farm or by other water users. Thus, the actual volume of water made available to other uses can be small (NRC, 1996a).

Evidence does exist, however, that there are significant opportunities to increase efficiency. Also, the NRC has pointed out that irrigation efficiencies vary significantly and has itemized numerous opportunities for implementing efficient practices and measures (NRC, 1996). Further, an examination of Reclamation's *Summary Statistics* reveals a diverse range of water application rates between water districts, suggesting a corresponding diversity of irrigation efficiencies (after accounting for differences due to climate, crops, and supplemental versus full service irrigation) (Reclamation, 1992). Thus, while the potential for improved efficiency in a given district is uncertain without a specific evaluation, the potential improve-ment over the 10 million acres in 1,000 Reclamation irrigation districts is substantial (Reclamation, 1992).

The Commission therefore recommends that the Secretaries of the Interior, Defense, and Agriculture actively encourage and work with users of federal project water to improve project water use efficiency and onfarm water use efficiencies wherever there is reasonable expectation that public purposes might be served. In these cases, the Administration should provide incentives and technical and educational assistance for contracting agencies and water users. Many Reclamation irrigation districts have very limited information on water deliveries and use, making basic calculation of system efficiency difficult. Such data are prerequisite to assessing feasible options for improving water management.

Federal agencies investing in efficiency improvements should take full advantage of existing federal and state programs designed to protect conserved water as instream flows (such as the state of Washington's trust water rights program). In addition, the Administration should encourage states to adopt laws and regulations that allow water users to benefit from conservation efforts and that allow a portion of conserved water to be applied to instream flows and other environmental purposes including groundwater protection.

The Congress and affected agencies should consider requests for new water storage or modifications to existing projects to augment supply only after the efficiency of the existing project or water use has been evaluated and opportunities for improved efficiency examined and implemented where cost effective.

Pricing.—Federal agencies providing water-related services, such as storage, delivery, or flood control, must re-evaluate the subsidies they provide to users of the services to determine whether such subsidies serve current and future needs. The Congress and the federal agencies should recognize the signals that such subsidies send to users regarding the efficient use of water. Subsidies can create significant disincentives to use water efficiently. Therefore, in new or renewed water contracts, agencies should seriously consider pricing their services closer to the full taxpayer's cost of providing the service, thereby promoting water rate structures that encourage efficient water use. The Commission believes that, in many cases, more realistic prices will lead to improved water use, without sacrificing the other social values supported by existing subsidies.

Operation of Dams and Water Delivery Systems.—The operations of many of the large federal dams in the West are currently under review. In most cases, these reviews are focused upon endangered species issues.[11] Further,

[11] Some changes in project operations have been formalized by statute, such as in the Grand Canyon Protection Act, Public Law 102-575, Title 18, 106 Stat. 4669, or the Central Valley Project Improvement Act, Public Law 102-575, Title 34, 106 Stat. 4706.

many dams are now providing benefits to a much broader range of interests than was originally envisioned when authorized. Therefore, the time seems right for a more systematic review of operations that could lead to adjustments in project purposes, operations, and even cost allocation.

The Commission recommends that the Secretaries of the Interior and Defense and the Chairman of the Federal Energy Regulatory Commission be directed first to prepare and submit to the Congress, for each of the dams they manage, a brief assessment of the value of undertaking a systematic review of the dam's purposes, authorities, and operations. Public scoping should be part of this process. The agencies should then be authorized and directed to undertake such reviews, prioritized based on scoping results.

In these reviews, the agencies should assess project operations in light of current and future needs for water storage and delivery, hydroelectric power generation, flood control, transportation, recreation, and other authorized purposes, as well as for purposes that may not currently be explicitly authorized, including environmental purposes such as watershed and aquatic habitat restoration. Wherever possible, these reviews should be undertaken on a watershed or river basin basis. The reviews should actively seek involvement and participation by the states, tribes, local watershed groups, and other stakeholders.

Any need for modifying a facility's structure, project authorities and purposes, cost allocation, or operations should be identified through a public planning process and reported to the Congress if statutory changes are required. The Congress should provide funding and authority for those changes which appear to improve the way water projects serve public needs while addressing equitably the rights, as well as the financial obligations, of current water users.[12]

Water Marketing and Transfers

The Commission has found that water transfers are an essential part of any discussion of the future of the West and its water. Voluntary water transfers are occurring throughout the West and can help meet the demand for new urban supplies and for environmental flows in a manner that is both fair and efficient. However, water transfers that occur without attention to their potentially damaging effects on local communities, economies, and environment can be harmful to ecosystems and

[12] Reoperation of federal projects must take place within the framework of existing compacts, water rights and contracts, and state water law. In some cases, state law restricts the types of changes that can be accomplished. In its report to the Com-mission, Reclamation identified some of these limitations:

> *Some state water laws do not recognize the interconnection and interaction of ground and surface water, making con-junctive management of water resources problematic.*
> *Definitions of 'highest and best use'; may not recognize instream flow as a 'beneficial use,' and, in some cases, state laws limit which entities may apply for and hold instream flow rights.*
>
> *Under some existing state laws, public environmental values for water use are unrecognized, which makes the envi-ronmental communities' desire to maintain and increase aquatic environmental amenities difficult to address.*
>
> *Existing laws may penalize water conservation or the environmental uses of water (use-it-or-lose-it stipulations), making efforts to encourage environmentally beneficial management practices difficult to implement.*
>
> *Differing provisions of water laws of bordering states may complicate efforts in dealing with basinwide ecosystem issues (Reclamation, 1997a).*

social systems that depend on irrigation economies. Governing institutions are therefore faced with a difficult balancing act—to facilitate transfers on the one hand, recognizing the benefits they may produce, and to scrutinize transfers on the other hand, understanding their potential costs to society.

The authority to approve a transfer or lease of water rights or changes in location and type of use rests for the most part with the states and tribes, and varies significantly between states and between federal projects. In some cases, the United States has a direct role in approving transfers; in other cases its role is more indirect, sometimes limited to compliance with the National Environmental Policy Act (NEPA) requirements to evaluate the effects of a significant federal action. However, because the United States oversees storage and distribution of substantial water in the West, its policy toward water transfers is fundamental. The principles for voluntary water transfers adopted by the U.S. Department of the Interior in 1988 (Interior, 1988) have encouraged the transfer of both Reclamation and non-Reclamation project water.

The Commission, in general, was persuaded by the recent detailed report of the NRC, *Water Transfers in The West: Efficiency, Equity and the Environment* (1992b), and endorses that report in general. Several of the following are findings and recommendations from the NRC report.

1. *Benefits From Voluntary Transfers.* Voluntary water transfers, if thoughtfully managed, can promote efficiency in water use while protecting other water-dependent values recognized by society. Voluntary transfers also represent a growing source of water for instream flows and other environmental purposes.

2. *Federal Role.* The United States should recognize the potential usefulness of voluntary water transfers as a means of responding to chang-ing demands for use of water resources and should facilitate voluntary water transfers as a component of policies for overall water management, subject to processes designed to protect well-defined, third-party interests. The Congress and federal agencies should review existing water resources law and policy in order to ensure that it does not stand as an impediment to voluntary water transfers.

3. *State and Tribal Approval of Transfers.* State and tribal governments have primary authority and responsibility for enabling and regulating water transfers, including identification and appropriate mitigation of third party effects. State and tribal administrators should develop and publish clear criteria and guidelines for evaluating water transfer proposals and addressing potential third-party effects. State and tribal administrative processes should provide for public and broad, third-party representation in the review of water transfer proposals. In addition to normal actions such as notices of proceedings, public hearings, and protest opportunities, programs should include affirmative review of potential third-party effects in cases likely to involve significant effects. States should provide leadership in exercising their water administration and planning responsibilities to identify opportunities for water transfers that might serve as instruments for achieving a wide range of water management objectives.

4. *Addressing Third-Party and Environmental Impacts*. Public interest considerations—especially environmental consequences and impacts on Native American assets and Hispanic and other rural communities with the potential to maintain environmentally sustainable ranching and irrigation economies—should be included among the third-party issues and legal provisions for permitting and denying water transfers. To the extent that public trust concepts and values cannot be represented dependably under existing laws and policies, states should develop new laws, institutions, and administrative tools to represent these concepts and values.

The costs of mitigating third-party effects should be internalized as a cost of the transfer—that is, the beneficiaries or proponents of the transfer should bear the mitigation costs as a matter of law and

equity. Therefore, the cost of the transfer should include sufficient funds—in the form of water, money, or other compensation—to help mitigate third-party effects.

Water transfer processes should formally recognize interests within basins of origin that are of statewide and regional importance, and these interests should be weighed when transbasin exports are being considered. States should revise laws that now exempt water facilities from taxation by the county of origin, either because the exporter is a public entity or because of provisions that make such facilities taxable only in the county where the water is used. Mechanisms to compensate communities for transfer-related losses of tax base, such as an annual payment in lieu of taxes, may be needed.

5. *Costs of Transfers.* The cost of water transfers should be kept as low as possible. This provides the greatest incentive for transfers. It is then up to the responsible district and local officials, states, Indian tribes or nations, and federal agencies to actively determine whether any given transfer is in the public interest and should be allowed to proceed. The greatest social benefits from transfers occur when the transaction costs of transfers are low, but active oversight is provided.

To help reduce costs, policies might be designed so that, in general, transfers of acquired rights are limited to the amount of water that the seller consumptively uses. This may entail setting state, river basin, or regional standards for the consumptive use of water per irrigated acre based on crop type, historic water availability, and other local variables. Such standards should be flexible enough to account for variations in water availability and local conditions. Third parties should not have to develop data on the transferable quantity; data should be developed by the buyer or seller.

Regulatory requirements should be designed to encourage negotiated resolutions of conflicts. Consideration should be given to processes other than judicial proceedings (e.g., a state water court) to provide the initial evaluation of transfer proposals.

6. *Opportunities for Environmental Enhancement.* When water is marketed, there may be an opportunity to dedicate some of the newly available supply to public uses such as environmental protection. Some have proposed that the federal government take some of the money from the marketing of federal project water and use those funds to mitigate a project's environmental impacts. Others have suggested that transaction costs are already too high and that further "profit sharing" may unnecessarily impede transfers, which often are undertaken for environmental purposes. The Congress should set clear policy for the distribution of monies from the resale of federal project water. The issue is complex, but, on balance, the Commission concludes that the federal government should not try to recapture the subsidies involved in federal project water (beyond the repayment of all contractual obligations by the project beneficiary). The transaction costs of subsidy recapture would discourage desirable transfers and would represent a sharp break with past Reclamation policy. However, this recommendation would not preclude a restoration tax on transfers to help restore degraded aquatic ecosystems.

7. *Appropriate Revision of Regulations.* The Secretaries of the Interior, Agriculture, and Defense should revise their regulations as needed to facilitate and encourage marketing of water from federal projects and water banking to promote efficient water uses to the extent consistent with the ecological integrity of affected streams and the economic vitality of communities in the area of origin.

Enforcement of Reclamation Law.— Reclamation should also take steps to ensure that water use from Reclamation projects is in compliance with project authorities and federal

Reclamation law. Regulations should be promulgated providing for the resolution of the range of circumstances under which water has been put to unauthorized uses. Any water returned to the project as a result of eliminating such unauthorized use should be made available for other authorized project purposes, or for instream uses, if appropriate.

Flood Plain Management

Need for Overarching Flood Management Policy.—The 1997 floods in California, Nevada, and the upper Midwest, along with the 1993 Midwest/Mississippi floods, demonstrate the need for an overarching flood plain management policy to consistently achieve the nation's policies of flood control, disaster prevention and mitigation, disaster relief, and environmental restoration.

The Commission recognizes that the appropriate flood protection measures vary by location, density of population, land use, and other factors. The Commission notes that structural measures to protect against floods have produced substantial benefits over the years, and the repair of those structures following a flood event may be the most appropriate response depending on the ground circumstances. However, the Commission has concluded there is a need for strong preflood preparedness and planning to more thoroughly explore nontraditional[13] options and to ensure that agencies are capable of utilizing such options, as appropriate.

Recommendations.—

1. Recommendations of the 1994 Galloway Report should be adopted and implemented.[14]

The Galloway Report reflects four key themes:

(a) The responsibility for flood plain damage reduction through flood plain management should be shared among all levels of government and by those at risk of flooding.

(b) Enhanced organization and consistency of government activities would further flood plain management, and further the federal response to floods and flood recovery, in a manner that promotes future flood damage reduction.

(c) The analysis of flood risk and means to avoid, minimize, and mitigate flood risk should be pursued in a comprehensive manner that integrates hydraulic, hydrologic, and ecosystems management within a watershed.

[13] The Commission intends the term "nontraditional," as used in this section, to be defined broadly and to include, among other measures, use of easements and the Conservation Reserve Program, setback and redesign of levees, elevation of critical infrastructure located in the flood plains, and buyouts, as well as the range of other nontraditional options set forth in the Gallo-way Report and in the February 18, 1997, Memorandum to Federal Agencies from Franklin Raines, Director of the Office of Management and Budget and Kathleen McGinty, Chair of the Council on Environmental Quality.

[14] The Commission recognizes the specific concerns the Corps raised with the report and recommends that those concerns be taken into account as the recommendations and action items are implemented. Such concerns include possible major budgetary, manpower, and resource implications of implement-ing some of the concepts in the report such as the use of the Standard Project Flood level of protection as a minimum level of protection for urban areas. The Corps also expressed con-cerns that the Galloway Report went beyond recommendations for flood control and protection and extended into other areas, such as land acquisition activities. The Commission has made similar recommendations to those in the Galloway Report concerning interagency coordination, watershed and riparian restoration and restoration, land acquisition, and ecosystems management and, therefore, endorses the substance and approach taken by the Galloway Report.

The Commission also notes that the Galloway Report contained a number of recommendations directed at state and local governments which are outside the purview and scope of this Commission.

(d) The reduction of vulnerability to flood damages should be pursued by giving full consideration to all possible alternatives including permanent evacuation of the flood-prone areas, flood warning, floodproofing of structures remaining in the flood plain, creation of additional natural and artificial storage, and adequately sized and maintained levees and other structures.

2. Development of flood plains should not be subsidized by the federal government, in part to minimize growing losses of life and property as a result of flooding events, and in part to provide the flood storage, conveyance, and environmental benefits associated with healthy riparian and riverine ecosystems.

3. All federal expenditures for flood plain management and disaster relief should consistently encourage responsible behavior and discourage behavior likely to lead to future loss of life and property.[15]

(a) The Administration and the Congress should establish a policy that communities and individuals who are eligible to purchase flood insurance and have failed to do so are not eligible for major federal disaster assistance, except for such assistance as needed to provide for immediate health, safety, and welfare, and to provide a safety net for low-income flood victims. The Administration should step up its educational efforts concerning hazards, hazard mitigation, the availability of flood insurance, buyout opportunities, and other measures to reduce exposure to risk.

(b) The Administration should increase incentives for communities who participate in flood plain management planning through FEMA's National Flood Insurance Program Community Rating Systems. Participants with high ratings should be eligible for a higher proportion of flood relief funds than nonparticipants.

(c) Federal flood insurance underwriting should be modified to resemble the private insurance industry so that flood insurance premiums increase with repetitive losses.

(d) Communities should be encouraged to procure private flood insurance to insure public structures.

(e) The Corps' Floodplain Management Program should be aggressively promoted and funded in order to advise communities of best management practices and to prioritize public and individual assistance grants for recovery from flood events. It should be integrated with the Corps' emergency response/recovery operations, using the Corps' new authority under the Water Resources Development Act of 1996 to implement nonstructural flood plain management measures in lieu of structural repairs.

(f) The Administration should pursue, and the Congress should accept, a change in law to require 50/50 cost sharing among federal and local governments for funding future structural flood control projects. For nonstructural approaches to flood mitigation, the federal government should fund up to 75 percent.

[15] A number of specific action items for implementing this recommendation can be found in the Galloway Report and should be implemented by the Administration. Such items include requiring actuarial-based flood insurance for properties behind levees which provide less than standard flood protection and reducing losses to repetitively damaged insured properties through surcharges and increased deductibles. The Commission notes that the waiting period for flood insurance has been increased to 30 days by the Flood Insurance Act of 1994 and believes that this interval should not be decreased.

4. The federal government should place greater emphasis on, and the Congress should provide funding for, the disaster relief programs for nontraditional approaches to recovery from disasters. The Congress should provide funds from outside of the disaster relief programs for planning and preparedness programs to enable federal and nonfederal agencies to use nontraditional responses to flood events, including relocation before and after such events, purchase of easements, and so forth.

(a) The Administration should streamline procedures for federal assistance to states for land purchase and relocation and establish consistent procedures to permit preflood sales (to permit and encourage relocation out of key flood plains) as well as postflood sales and relocation.

(b) The federal government should more aggressively engage in alternative nontraditional solutions including purchasing flood plain lands or flood easements, setting back levees, restoring wetlands and natural storage areas, floodproofing structures on the flood plain, and allowing for natural pooling of rivers in lightly populated areas.

(c) The federal government, through financial and other incentives, should encourage relocation of structures away from flood-prone areas.

(d) The Congress should provide generic authority to the water management agencies to engage in developing and implementing nontraditional options to lessen the loss of life and property following a disaster and to engage in environmental restoration activities in riparian and riverine areas to lessen the severity of floods. A lead agency to coordinate these activities should be named.

5. The federal agencies should explicitly recognize that periodic flood plain inundation benefits the ecosystem by restoring conditions for wetlands and riparian areas, reducing salt and sedimentary accumulations, re-establishing fish and wildlife habitat, enhancing agricultural lands, improving water quality, and recharging groundwater. A key strategy for minimizing flood losses includes protecting and restoring riparian and riverine areas. The Commission has made a number of recommendations concerning aquatic ecosystem restoration ("Resource Management and Restoration," above). As noted, the Congress should authorize and fund the federal agencies to engage in aquatic restoration activities.

6. The federal government should encourage adoption of an integrated flood plain management and ecosystem management strategy on a basin level to meet dual objectives of flood loss mitigation and environmental restoration. Permanent basin level interagency organizations should be established to implement a flood plain management strategy. The interagency organization should be interdisciplinary, engage in alternative solutions before and in response to flood events, develop rapid interagency/intergovernmental response, and engage in efforts to inform communities and individuals of programs and relief options.[16]

[16] The Galloway Report recommends a similar effort: the Administration should establish an interagency task force to formulate a coordinated approach to multiple objective watershed management; Interior, USDA, and EPA should coordinate and support federal riverine/riparian area restoration activities; the Administration should set up a lead agency for coordinating the acquisition of title and easements to lands acquired for environmental purposes; the Department of Transportation should focus land acquisition efforts on river reaches and areas with significant habitat values or resource impacts; agencies should be required to cofund ecosystem management using operation and maintenance (O&M) funds; funds for mitigation lands should be allocated in concern with and at the same pace as project construction.

Maintaining the Water Infrastructure

A tremendous investment has been made in water infrastructure across the western United States by many federal agencies, states, and private entities. Many of these structures are getting older and must necessarily be the focus of significant maintenance decisions. The issue of facilities maintenance is critical, given the declining federal budget and the broader purpose projects are serving today.[17] The Commission recommends that the Congress and the agencies:

1. Appreciate the importance of sufficient funding for O&M of significant federal facilities upon which the public relies for water supply.

2. Recognize the fiscal desirability of preventive maintenance—that deferred maintenance may require eventual capital expenditures far exceeding preventive maintenance costs.

3. Place greater importance on maintaining and rehabilitating key existing federal water infrastructure than on funding for new projects.

4. Develop a long-range approach to maintenance, considering other means of supporting maintenance through expanded use of user fees and other cost-sharing approaches.

5. Explore further application of revolving funds and the like, which allow needed maintenance to be accomplished in a more timely and efficient fashion. These approaches, in many instances, can enable agencies to delay some kinds of expensive rehabilitation because they know that when monitoring indicates a need for rehabilitation, the funds will be immediately available.

6. Continue to vigorously pursue means to become more efficient and effective to reduce costs of operation.

The Commission concurs that the goal of privatizing certain federal assets—making government work better at less cost—is laudable and encourages the Administration to proceed with this initiative. The Commission concurs that it is desirable to transfer assets out of federal ownership in those situations in which the new owner can manage those assets as well as or better than, and at less cost than, the federal government. The Commission, while concerned about the slow pace of actual transfers in Reclamation's program, concurs with the Administration's insistence that transfers be in compliance with environmental laws, that the public be involved in the transfer process, and that taxpayers' interests be protected. At this time, the Commission concludes that the transfer of multipurpose projects should be approached carefully, with special attention to how various purposes, along with environmental protection and restoration efforts, will be met.

Similarly, the Commission is wary of privatization of federal hydropower assets. These assets are usually one component of multipurpose facilities that serve irrigation, municipal, recreational, and fish and wildlife purposes as well as power. It is not clear to the Commission how these other needs might be met after privatization, especially when the new owner will likely be a power provider interested in maximizing the value of the power output of the facility.

While an analysis of the advantages and disadvantages of a deregulated power industry and privatized federal hydropower facilities is beyond the scope of this Commission, the potential impacts such actions might have on the aquatic environment are not. To one degree or another, dams have contributed to changes—all significant and some adverse—on aquatic ecosystems. Privatizing the dams and the

[17] Reclamation has 631 major facilities in the West. Responsibility for O&M has been transferred (usually to irrigation districts) for 398 of those facilities. For those cases, the operating partners are reimbursed for the facility O&M.

power facilities has the potential to reduce environmental mitigation, protection, and restoration efforts and to further degrade the aquatic ecosystems. The Commission believes the federal government, because it is such a large producer of hydropower in the western United States, should adopt a wait-and-see approach to the transfer of mainstem dams and power generating facilities, given the uncertainties in the new energy marketplace and the importance of ensuring that environmental protection and restoration efforts are continued and fully protected by the new owners as part of any future transfer.[18]

The Commission offers the following recommendations concerning the transfer of federal assets:

1. The Commission notes the Reclamation criteria for the transfer of title. We are not aware that other agencies with water and power management responsibilities have established similar criteria. We recommend that agencies contemplating facility transfers establish criteria for the transfer of title and that such criteria be consistent among the agencies. The agencies should consider the following in their criteria:

(a) Statements of types and sizes of projects which are or are not subject to transfer or sale.

(b) Definition of the financial advantages to the federal government which shall be a precondition to any sale or transfer.

(c) Methodology for determining a price which adequately reflects both fair market value and the government's investment.

(d) Scrutiny of all near term and potential effects of the transfer on water allocation and prices.

(e) Determination of a level of maintenance needed to protect the public interest.

(f) Opportunity for public input to the terms and conditions of the transfer.

(g) Development of a facility-specific transfer plan, reflecting public input.

(h) Description of the transferee's exact responsibility for maintenance, the transferee's fiscal responsibility, and the transferee's financial ability to fund maintenance indefinitely.

2. The Commission recommends the President task the Office of Management and Budget (OMB) with responsibility to ensure consistency among the policies and programs of the various federal agencies which might transfer water and power assets. A key responsibility of OMB would be to ensure that such transfers (of water and/or power facilities) will not result in further environmental degradation, that mitigation responsibilities are met by the new owners, and that the environmental and other objectives set forth in the basin governance plan are met.

3. The Commission notes that Reclamation gives preference to existing beneficiaries to take title to its projects. We recommend that the federal government consider whether the range of potential transferees should be broadened to include states or other nonfederal entities with the financial and technical capabilities to own and manage such facilities or projects.

4. The Commission recommends that the federal government continue to retain ownership and control over large systems of federal water facilities.

[18] For a description of federal hydropower in the western United States, as well as a discussion of the pending issues which may have an impact on the power facilities and aquatic ecosystems, see Driver, July 1997.

It is important to recognize that these projects have critical functions important to multiple users, stakeholders, beneficiaries, and the public which should be protected. Few, if any, owners outside the federal government can provide adequate protection to these multiple, conflicting, and often interstate interests.

5. The Commission recommends generally against the transfer of title to federal hydropower and transmission system assets which are used by the federal power marketing administrations. At this time, we do not see how transfer of these assets out of federal ownership can be done in a manner to meet project purposes beyond power production. This is not opposition, per se, to such transfers; only an expression of our concern that, at this stage, they can be carried out in a way that protects the broad public interest.

5. Protecting Productive Agricultural Communities

Over the last century, the farm population in the United States has declined steadily and dramatically, while the value of food production has increased. In addition to the decline in the number of farms and ranches, those remaining are increasingly very large, often corporate, operations or small hobby or specialty farms. In the last several years, federal supports for agricultural production have been reduced, reflecting two goals—making production more market driven and reducing the environmental costs associated with greater agricultural production. For the better part of this century, substantial assistance to agricultural production—in the form of price supports, low-cost energy, and low-cost water—encouraged the expansion of low-priced food production for the U.S. and for export to the rest of the world. Some of the expansion occurred in areas which were economically marginal or which damaged important natural resources. As federal supports are reduced, further contraction and restructuring of agriculture is likely, and the family farm and ranch are at risk.

At the same time, urban growth, suburban sprawl, and the growth of ranchette and luxury second homes in rural areas have placed pressure on farmers to sell land or water, or both, to support this growth. While this has been financially beneficial to many individual farmers; in some areas, the conversion of agricultural lands to other uses has had serious impact on traditional economies and cultures. Suppliers, implement dealers, grain operators, feed lots, and others, such as grocery stores and car dealers who depend upon a healthy agricultural economy in town, may close down and may constitute "third-party impacts." The traditional, close-knit nature of farm and ranch towns may change.

Further, there can be important environmental consequences of some types of water conversion. Aquifers and wetlands that depend on irrigation flows may dry up. Fields which lose their irrigation and are not planted to permanent cover can create mini dust bowls or become a source of noxious weeds.

Particularly in the interior West, existing ranching and farming operations are concentrated along riparian corridors, in flood plains, and on rich bottomlands. While these operations sometimes have negative environmental impacts on riparian resources, they also maintain the area as relatively undeveloped land, providing important benefits to wildlife and open space. As urban areas grow in the West, farming and ranching operations provide important open-space buffers between urban centers. Further, intact agricultural communities maintain an important part of the nation's culture and tradition.

Maintaining these important benefits from farming and ranching operations in the face of changing

national and international economies, greater concern for protecting environmental resources, and the tidal pressure of urban growth is a complicated and difficult task, requiring attention from the federal, state, and local level. National farm and public lands grazing policies, tax policies, and other laws affect the economic viability of individual operations. The federal authorities for individual water projects and state water law can affect the opportunity for individuals to sell water rights. And, most importantly, county land use plans and taxes determine whether lands can be developed or must stay in agricultural production. Local officials are seldom willing to restrict the rights of individual landowners to sell or develop property or water rights. State and national efforts to encourage land use planning have not been popular.

It is the judgment of the Commission that, in the majority of cases, federal water policy affects but does not drive these trends or changes. Nor can we envision acceptable federal water policies that can manage these trends to the satisfaction of most parties. However, the trends have significant effect on water resources, federal water projects, and related economies and environmental resources. We do recommend:

1. That federal water policy not subsidize growth and development in productive agricultural areas. For example, federal water managers should seek to ensure that those receiving water from federal projects for domestic or municipal purposes are charged an appropriate rate under project authorities, not just the basic project rate for agricultural water. Also, new urban development should pay the full costs for managing increased urban runoff, rather than relying on irrigation project drains.

2. That state and local officials give more attention to putting growth on a sustainable basis, recognizing the substantial state and local subsidies that are often given to sprawl development. The Commission notes and supports the new initiative by the Western Governors' Association to establish an open lands conservation agenda for the West (Western Governors' Association, 1996b).

3. That federal agencies participate with and encourage local efforts to develop plans for land use that preserve the important economic, environmental, cultural, and amenity value of open agricultural and ranchlands. The Congress and federal agencies should recognize that these development pressures often unite traditional water users and conservation interests, whose joint efforts can serve important regional and national goals. Agencies should continue programs to obtain or facilitate acquisition of conservation easements or development rights in support of such local planning efforts.

4. That federal water agencies develop or continue programs that support sustainable agriculture by:

(a) Strengthening locally led conservation partnerships by ensuring a strong base program of technical assistance and financial incentives to address the array of water resources issues stemming from private and tribal lands.

The conservation program of the NRCS should be reinvigorated under dynamic leadership. Efforts to consolidate NRC field operations have detracted from watershed efforts and have reduced the capability of local people to respond to increased resource management pressure. The technical support and cost sharing of such programs as the Great Plains Conservation Program should be restored in order to empower conservation districts, individual farmers, ranchers, and landowners. Significant incentives, more numerous technical experts, and increased accessibility of NRCS field personnel are essential.

(b) Assisting in development of water conservation plans from districts contracting for federal water supplies.

(c) Providing loans, grants, and other financial assistance that promote flexible water conservation on farm lands and other lands.

(d) Conducting research to improve and promote water conservation and water quality.

(e) Facilitating water transfers and marketing of federal water within states where state and local interests find them to benefit both water conservation and the financial viability of agricultural operations.

5. That irrigation districts, water management agencies, local and state officials, stakeholders, and affected publics work together to anticipate the demands for water conversion and develop plans for such conversion which protect the integrity of communities and the environment.

Reducing Costs of Environmental Compliance, and Increasing Certainty of Water Use for Water Users

Changing social values, demographics, economics, and environmental conditions in the West are requiring changes in water use. This has placed considerable pressure on traditional water users to meet increasing environmental regulations, obligations to Native Americans, and other pressures for changes in water use. Water users face increasing uncertainty regarding their annual water supply, the cost of their water operations, and renewal of their water contracts or permits. Given the rapidly changing conditions in the West, and given the interest on the part of the federal government in retaining the opportunity at the expiration of water contracts to revisit the appropriateness of current agreements, it is unlikely that this uncertainty of use and operating costs can ever be fully eliminated. However, efforts should be made by all agencies to reduce or avoid costs or uncertainties placed on water users that are not fundamentally necessary. We recommend that:

1. Agency policy and intent regarding renewal of water contracts and permits be developed and clearly stated. Where possible, conditions for renewal should be stated.

2. The process for renewal of water contracts and permits be started sufficiently early for all parties to develop proposals, conduct negotiations, and carry out NEPA studies prior to expiration of existing contracts.

3. Water contracts and permits should make clear how resource users can benefit from conservation of the resource and from voluntary conversion of the resource to other desired uses.

4. Transaction costs for conversion of water to other uses should be kept as low as reasonably possible by federal agencies to allow water users the greatest incentive for conservation and conversion. Whenever possible, the costs of transactions should be specified up front, so that the benefits to users can be predicted with reasonable certainty.

5. Efforts should continue to address environmental conservation and recovery more comprehensively and, thus, provide resource users more certainty in their obligation. Examples include development of Multi-Species Habitat Conservation Plans and the associated "no surprises" policy.

6. Regulatory agencies should continue the process of improving and streamlining implementation of regulatory authorities. The Administration's initiative to reduce costs and burdens of implementing the ESA, the Council on Environmental Quality's initiative to improve

implementation of NEPA, and Federal Energy Regulatory Commission's redesigned process for considering renewal of hydropower licenses are three examples of efforts to improve and reduce the costs of governance while still meeting the fundamental goals and objectives of laws or programs.

6. Improving Decisionmaking, Reducing Conflict

In addition to recommending more integrated governance of river basins and watersheds, the Commission has identified several other areas where sound decisionmaking can be reinforced and improvements made in the way we deal with conflict over resource use.

Coordinating Federal Water Management

One difficulty with water resource management in the West is that there are multiple interests represented within any given department, with no merging of these interests below the Secretary. Perhaps the most important example related to water resources is that of the Department of the Interior with the extremely divergent congressional mandates carried out by BLM under the Assistant Secretary for Land and Minerals Management; Reclamation under the Assistant Secretary for Water and Science; Service and NPS under the Assistant Secretary for Fish, Wildlife, and Parks; and BIA under the Assistant Secretary for Indian Affairs.

The same problem exists between the various federal Departments; e.g., Interior water agencies versus the National Marines Fisheries Service in the Department of Commerce, with line supervision merging only at the President or Vice President.

In both instances, only issues of major political or national significance can hope to get the attention of the Secretary or the President necessary to resolve the interdepartmental or intradepartmental conflict. The vast majority of the issues, although not rising to this standard, are extremely important and require authoritative and informed policy leadership for resolution. This usually requires a degree of attention, including the commitment of time, beyond the means of any Secretary or Assistant Secretary, let alone the White House. Compounding this problem is the fact that the typical resource issue has a real and political lifespan that far exceeds the tenure of any political leadership. This creates a leadership void. At best, informal structures and concerned individuals fill this leadership void, but they are most often unempowered, misunderstood, and inefficient. Line management in the involved federal agencies is left to work these issues out themselves. Thus, the existence of the conflicted federal presence today.

Solutions:

A. An authoritative policymaker should be appointed who has the time and interest to shepherd the issue on behalf of the President or Secretary, as appropriate.

   1. They must be formally appointed to perform this function with clearly defined authority and responsibilities.

   2. They need to have a line of communication to the ultimate authority.

   3. They need a skilled and trusted staff advisor (recognizing the tenure of a political appointee averages under 3 years) to provide continuity.

B. A forum should exist at the policy level to consider various program and policy issues resulting in a clearly articulated federal objective. This objective must be clearly conveyed to the field organizations and managers.

C. A clearly designated lead organization should be established at the field level with authority and support or an appointed and empowered coordinator with direct line to the designated policymaker.

D. A single point of contact for legal counsel should be named for the issue to coordinate and mediate all involved federal agency counsel for the line managers, the policymaker, and the Department of Justice (in the event of litigation).

Coordination of Federal Water Policy

The most recent institution charged with coordinating federal water policy was the Water Resources Council, created by the 1965 Water Resources Planning Act and defunded in 1981. Since then, coordination of federal water programs, when it has occurred, has come variously from the OMB, the Council on Environmental Quality at the White House, and such ad hoc bodies as the Task Force on Floodplain Management.

The major stimulus for the Water Resources Council was to establish criteria for evaluating major water projects and to attempt to rationalize the latter stages of the development of river basin storage and control systems. Of course, it was precisely the Council's efforts to bring economic, environmental, and hydrologic sense to the array of separate projects that created such animosity toward the Council on the part of states, federal agencies, and other project sponsors.

A white paper prepared for the Western Governors' Association to assess ways to improve coordination of federal water programs found that:

> *A principal characteristic of federal water policy is that said policies are made in an ad hoc, decentralized manner. No agency of the Executive Branch is responsible for keeping an eye on 'the big picture.' Thus, federal water policy lacks a unifying vision or even a set of guiding principles. . ..* (Western Governors' Association, 1989)

In its report to the Commission, the Western States Water Council notes that, " . . .it seems evident that Congressional committee jurisdictions, department competition, and interest group ambition have contributed to a fragmentation in federal programs that militates against integration" (Western States Water Council, 1997).

Today, most recognize that the world in which federal water policy functions is vastly changed from that overseen by the Water Resources Council. Large federal water projects are not being funded, nor even proposed. Today, the need for policy development and coordination stems from the many environmental and social crises affecting the nation's rivers. In the West, federal agencies are responding to tribal water claims, endangered species listing, and CWA lawsuits in nearly every river basin.

The Commission believes that functioning river basin forums can play the major role in shaping, coordinating, and implementing federal policy at the regional level. However, we believe that there remains a need for national coordination of water policy and programs, especially as federal resources decline and the need for prioritysetting becomes more acute. At a time when our water resources policies are in such rapid transition, it is remarkable that there is no regular forum for discussion of these issues by involved federal officials.[19]

[19] A member of the Galloway Commission described how striking it was that, for the first time in many years, most of the key flood management agencies were actually in the same room talking about the government's approach to flood mitigation.

Program and Budget Coordination

The section of this report, "Integrating River Basin and Watershed Governance," describes the need for coordination of federal agency budgets on large, multiagency initiatives such as basinwide recovery and restoration programs.

We recommend the establishment of a process to coordinate and approve federal agency regional budget requests for each fiscal year and flexible budget requests for each ensuing 5-year period.

Federal agencies subject to such coordination would be determined for each basin depending on the significance of their programs to management or restoration of the basin's water resources. Typically, this would include Reclamation, the Corps, Service, EPA, and USGS, and may also include the Forest Service, National Marine Fisheries Service, BLM, BIA, the National Weather Service, and NRCS.

The coordination process should result in a reviewed and approved annual and 5-year budget plan of each agency's river basin offices in support of the annual budget requests submitted to the agency headquarters. In many instances, it should also result in a multiparty budget crosswalk similar to that developed for the Everglades initiative. To foster the achievement of coordinated programs, the agencies would be directed to coordinate actively with each other in the development of their basin water programs and budgets. In order to accomplish this, the agencies would:

1. Disclose to one another their anticipated programs and budget needs for the next fiscal year and for a projected 5-year period and their accomplishments to date.

2. Plan and execute their activities so as to assist each other in achieving consistent, measurable federal goals.

3. Submit agency budget requests pertaining to water resource management and development for mandatory review at the regional or watershed level for interagency programmatic coordination and consistency.

4. Set joint objectives for federal activities throughout the basin in such areas as water quality, water supply, ecosystem restoration, flood management, species protection, and social and economic vitality.

5. Cooperate fully to integrate enforcement of federal laws, especially when responsibility does not reside solely in one agency, such as working cooperatively to simplify, streamline, and, when possible, consolidate federal regulatory permit processes.

6. Work together to fund and develop sound scientific information including sharing with each other all important scientific results, data compilations, studies, and reports which substantially underlie their past and future program plans and budget requests.

The Federal Role in Research and Data Collection

Using Good Science.—Sound, unbiased data and findings are a prerequisite to the success, efficiency and economic prudence of many federal activities. Decisions based on slanted, scanty, or untested theories may have wasteful and disappointing consequences. The Commission recommends that when federal agencies undertake sizable projects or programs which depend on new scientific research or knowledge, the agencies should take steps to assure the validity and credibility of the science. Such projects may include major changes in river operations, major species recovery programs, or extensive monitoring and adaptive management programs.

The aim is to bring wider expert review and contribution to research and monitoring plans, data analysis, and assessment of conclusions. Options include external review panels, such as NRC review committees and publication in peer reviewed journals.[20] Also, joint investigations with universities and professional groups, project conferences, and symposia should be utilized.

Given the cost and time required for peer reviews, they should be used when justified by the potential impact on the project. However, when used, project planning must include sufficient time and budget to support participation by outside experts from the very start of the effort.

Even when intensive participation by outside experts is not justified, agencies should still publish or otherwise make public their data, findings, and reports so that the public may be informed and the scientific community at large may comment on or contribute to the activity.

Adaptive Management and Monitoring.—When natural river systems and their associated biota are combined with extensive water control structures, the resulting network of interrelationships is extraordinarily complex. Today's crises of water management (e.g., decline of salmon runs) combine the complexity of the physical and biological system with the high stakes of major regional economies and property rights. In these situations, it is rare that our understanding of the system will be sufficient to select remediations with complete confidence in their effectiveness. Costs of actions will be high, and certainty of outcome will be modest. Yet, because of the deteriorating situation, action must be taken.

This dilemma characterizes the management of most western river systems, nearly every one of which is involved in critical endangered species, water quality, or similar problems. Therefore, almost every river system must be operated within a framework of adaptive management.[21] The Commission endorses and encourages the use of true adaptive management wherever long-term programs or projects are implemented or facilities operated that may have significant impact upon valued environmental, social, economic, or other resources, and where significant uncertainty exists about the best management action or its effects. Adaptive management should be implemented keeping the following two points in mind:

(1) What gives scientific validity to adaptive management and distinguishes it from crisis management, is the deliberate setting of goals, selection of indicators for monitoring, design and implementation of a management strategy, and regular revisiting and updating of the strategy based on the monitoring data.
(2) What gives political reality to adaptive management is an open and inclusive process

[20] An example of this approach is found in the September 1996 amendment to the Northwest Power Act, directing the Power Planning Council to convene an 11-member panel of independent scientists to review the its Columbia River Fish and Wildlife Program for recovery of several threatened and endangered salmon runs. This panel evaluates projects proposed for the Program, determining whether proposals rely on sound scientific principles, benefit fish and wildlife, and have clearly defined objectives and outcomes with provisions for monitoring and evaluation of results. The panel's 1997 report to the Council contains many useful recommendations about the process of designing, implementing, and monitoring aquatic restoration programs.

[21] As described earlier in this report, adaptive management is a process where goals for management of a resource are defined and critical resource and production indicators monitored. The best option for initial management of the resource is selected based on available information. Monitoring tracks the changes resulting in the resource, giving information on both the fundamental dynamics of the system and on the appropriateness of the current management option. Adjustments in the management of the resource can then be made and monitoring continued.

for establishing the elements of its framework. Vital to success is the agreement of stakeholders on the rules, especially the rules for revising operating plans based on the monitoring data. A strong commitment to maintain the monitoring program for the long term will not only provide good management data but will also build trust among participants in the soundness of the process.[22]

Monitoring.—In its review of the first 25 years of NEPA implementation, the Council on Environmental Quality concluded that, "In most cases at present, agencies do not collect long-term data on the actual environmental impacts of their projects. Nor do agencies generally gather data on the effectiveness of mitigation measures." Therefore, in addition to supporting the increased use of adaptive management, the Commission recommends that agencies give more attention to monitoring significant environmental resources, programs, and environmental mitigation plans.

Water Research.—The Congress should acknowledge the scarce nature of western water resources and should recognize that water resources research is a legitimate federal interest and should be supported. To address these issues, the Congress should fund a tightly structured research program. A substantial effort must be made to consult with state and other water managers to ensure that research is directed at high-priority problems and to coordinate research across the federal agencies so that limited research funds may be spent most efficiently.

Areas that seem to be a high priority include:[23]

- Water treatment and reuse technologies.
- Use of impaired waters for various purposes.
- Approaches to recovery of threatened and endangered aquatic species.
- Watershed and river dynamics, with special attention to questions of adaptive management and monitoring.
- Land use trends and impacts on water and related resources.

In addition, research is needed on how water institutions should respond to changes in the way in which society is making resource decisions—the waning influence of governing bodies and the growing power of direct citizen participation and lawsuits. The history of water resources development has been the creation of coalitions

[22] Among the points stressed by practitioners are:

1. Needing to focus monitoring on the most important indicators, including social and economic as well as biological.

2. Monitoring variables that are affected by management and which provide information relevant to management options.

3. Recognizing the degree of uncertainty in the knowledge and the variability of the system and match monitoring to it, in level of detail and duration.

4. Not trying to monitor everything, or things that would be just nice to know. Know how the results of the monitoring will be used.

5. Ensuring that all of the major management activities are included in the adaptive management effort. While one can't control things like annual precipitation, one should strive to include in the program, for example, every agency having significant management control over the resources.

[23] See Minckley, *A Report to the Western Water Policy Review Advisory Commission, etc*. for recommendations concerning specific research requirements identified by a number of leading scientists. Also, Reclamation, in its report to the Commission, notes that "River basin and project-specific databases vary greatly in type and amount of information, ease of access, and transferability" and that "sufficient data are generally lacking on the distribution and habitat needs of nongame, nonlisted, aquatic species and on aquatic and riparian vegetation" (Reclamation, 1997a).

around big projects which increased the water pie—all the players got more. Now the challenge is to shape institutions that can respond to signals that the carrying capacity of the resource has been exceeded and that can pull groups together to reallocate a shrinking pie—a nearly impossible task for our current institutions.

We believe that more of the research by USGS and other agencies should be driven by the information needs of managers attempting to manage water resources on a sustainable and watershed basis. We recommend that USGS work with other federal resource agencies and the states to determine highest priority policy-relevant areas for research.

National Water Data.—Water quantity and quality data are collected by many organizations at the local, state, and federal level. Many purposes are served by this data collection; among the most significant are verification of attainment of water quality standards and determination of water flow, use, and rights. As our interests in water resources become more diversified, programs to monitor the resource have also grown. Two critical needs have emerged related to these programs: (1) improving efficiency and coordination in data collection and (2) ensuring continuity and coverage in data collection.

The longstanding programs of USGS to collect and publish basic streamflow information provide very important information to a broad community of water users and water management organizations. This data collection is cost-shared by USGS and other federal, state, and local agencies. For many reasons, including high costs of data collection and tighter state and federal budgets, the number of gauging stations being maintained has declined substantially. The Commission received considerable comment about the need to maintain and ensure the continuity in this basic data collection program. As the competition and conflict over water increase, the value grows of a nationwide, standardized, highly credible source of information. Steps should be taken to develop, among the agencies and cooperators, a plan for the future of this program that results in greater financial and programmatic stability, and this plan should be presented to the Congress for additional funding, if needed.

Similarly, the collection, analysis, and publication by USGS of water use data from the states has served as one of the few sources of information about regional or national trends in stream diversions, water supply, and use. As our focus on water management is increasingly on the river basin or watershed, often spanning multiple states, it is important to maintain this source of information for both its broad and historic view.

USGS and EPA are engaged in several water quality data collection programs, in concert with the states. The largest of these is the National Water Quality Assessment (NAWQA). To improve the coordination and efficiency of these data programs, we encourage the efforts of the Interagency Taskforce for Monitoring, which includes representatives from all levels of government, to conclude the development and implementation of a national strategy under the National Water Quality Monitoring Council.

We strongly recommend that further steps be taken to add a focus within NAQWA on critical biological indicators, in addition to the physical and chemical variables currently assessed.

While groundwater use is an area of water management that is arguably the least sustainable in many areas, given current practices, data on this resource is not systematically collected and coordinated, either by the states or USGS. Considerable useful work has been accomplished by USGS on individual aquifers, usually as conditions have become a cause for concern or economic harm. A more systematic approach by local, state, and federal agencies seems

prudent, given the increasing reliance on groundwater by agriculture in some regions and by municipal water users in many areas. USGS, in conjunction with state officials, should systematically collect data on groundwater use and publish forecasts of aquifer life, to assist decisionmakers.

Further examples of such suggestions are contained in NRC's recommendations for greater USGS focus on watershed research (NRC, 1997b).

Data Sharing.—Federal agencies should pool/share resources with state and local governments to share water data, funding, and data collection responsibilities, as well as to prioritize data collection and research. Ideally, such water data should be collected and archived on a river-basin basis, and every effort should be made to make the data easily available to all basin agencies and the public.

Public Participation.—Over the past 15 years, federal resource agencies have made great strides in seeking and incorporating public participation in resource decisions. Examples of elaborate, extensive, and lengthy consultation processes are now the norm rather than the exception for major resource decisions. The Commission recommends agencies strive to:

1. Maintain public awareness and access to information on the current operation plans for dams and other river facilities. While most facility managers hold annual briefings on river operations with water users and sometimes the general public, these important aspects of public participation are often given less emphasis than consultation on new initiatives.

2. Continue the efforts to make agency guidelines, policies, authorities, budgets, and program information available to the public. Agencies have already made substantial use of the Internet in this area.

3. Support and encourage local groups and organizations working on watershed issues. Ensure that, when these groups are a source of information or public input, the membership of the groups is taken into consideration so other perspectives can be sought as needed. When federal funds are used to support such groups, or when these groups are intended to represent the broad public, ensure that the membership is representative and fairly balanced.

4. Continue efforts to facilitate communication and negotiation among competing resource users. Increasingly, agencies are acting as conveners of interests, facilitating negotiations among interest groups that are often best able to develop creative solutions. While doing this, agencies must ensure that the process has appropriate openness and accountability to the broader public and that the national statutory responsibilities of the agencies are made clear and are protected as these negotiations proceed.

Federal Advisory Committee Act.—Federal Advisory Committees are a formal approach to citizen participation in which citizens are formally named to a committee which deliberates in open public meetings to develop recommendations to the federal government. This approach is especially useful for complex problems where participants must develop a detailed understanding of issues, where negotiations among interest groups are needed, or where the duration of activities requires sustained participation and continuity in membership. These groups provide formal advice to the federal government, meant to be given special weight in an agency's diliberations.

To ensure openness in the creation and functioning of these groups, Congress passed the Federal Advisory Committee Act (FACA) which stipulates procedures for chartering committees with a

balanced slate of members, for deliberating policy options in a public setting, and for providing public notice of meetings and careful recordkeeping. Any group of non-federal employees which is utilized by the federal government for advice must meet the requirements of FACA.

However, many federal managers perceive FACA as restricting their efforts to work informally with groups that are addressing local watershed problems, but not providing formal recommendations to the government. In some cases, FACA has been interpreted as applying to these local groups. In such cases, the membership of such groups, their meetings, agendas, and recordkeeping would be subject to FACA requirements—an imposition that is unwanted by local groups.

A recent analysis of court cases involving FACA by Rieke (1997) suggests that this interpretation is not correct, but also suggests that clarification of FACA regulations is needed. Recently, the General Services Administration, which administers FACA, has announced its intent to revise the FACA regulations.

The Commission recommends as part of their review, that the definition of groups "utilized by a Federal agency" be clarified based on recent court rulings to make clear that it is permisible for an agency, without triggering FACA requirements, to:

(a) Participate with or on local groups in order to provide technical assistance, advice, or coordination in pursuit of activities of interest to the agency, and

(b) Obtain input on agency activities from such local groups, as long as the group is not the sole or primary source of public input to the agency, and as long as the membership and agenda of the group are not established by the agency.

The Commission also recommends that the Administration rescind Executive Order No. 12838 which directs that no new Federal Advisory Committees be chartered except based on compelling considerations of national security, health or safety, or similar interest. Because we view Advisory Committees as useful tools for consultation, we believe that this order sets the standard for creation of an Advisory Committee too high. As Rieke states, "The FACA standard, requiring advisory committees to be in the public interest in connection with lawful duties of the agency, appropriately leaves to agency personnel the decision whether an advisory committee is needed."

Alternative Dispute Resolution.—The last two decades have seen a great increase in the use of alternative dispute resolution (ADR) methods. ADR is composed of a group of negotiation and conflict-resolving techniques for settling disputes outside of judicial proceedings, most often using a neutral facilitator or mediator to help structure and manage the process. ADR programs are widely incorporated in local and state justice systems as an alternative to trials, while the Congress and the federal government have promoted ADR within their own jurisdictions, primarily to resolve labor disputes, contract disputes, and human resources problems.

For the last 25 years, ADR has also been applied to resolve conflicts over natural resources, including water resources. Agencies such as EPA have instituted negotiated rulemaking to involve affected parties in the formulation of regulations. ADR methods have been used to resolve surface and groundwater allocation decisions; to address water quality matters including effluent standards, discharge permits, drinking water treatment, and instream habitat; and to construct projects related to port development, water storage, hydropower, and flood control (Bingham, 1997).

ADR is not a panacea, but it does provide flexibility to address and involve a wider range of people and issues than is often the case with legal proceedings. This flexibility is an asset when trying to resolve complex issues with more of a watershed or river basin focus.

The Commission offers the following recommendations to encourage the greater use of ADR in water disputes and to direct its application appropriately.

1. State legislatures should consider legislation similar to the Federal Administrative Dispute Resolution Act to provide clear authority to state agencies to use ADR and to provide proper procedures.

2. The Congress should consider changes to regulations governing the major environmental statutes to:

(a) Identify specific decision points at which an individual or applicable agency could initiate an ADR process to address disputes.

(b) Authorize agencies to allocate funds for joint fact-finding and other ways of improving resolution of technical disputes.

3. Appropriate government research institutions should consider funding more research and evaluation on the use of ADR in resource disputes and other public policy matters.

4. We recommend that the emerging river basin processes institute mechanisms by which those who are in disagreement with governmental regulatory decisions may engage in mediation or, where appropriate, stipulated binding arbitration through an independent mediator or arbitrator or a coordinated agency tribunal.

Revising the Principles and Guidelines.—The *Principles and Guidelines for Water and Related Land Resources Planning* (U.S. Water Resources Council, 1983) were developed to guide the formulation and evaluation of water projects. They set the standard for analysis of proposed projects by the Office of Management and Budget and the Congress. The Commission recommends that these standards be updated to make them a more useful guide and decision tool for today's broader range of water management activities.[24]

[24] Revisions to be considered should include:

1. In cases with significantly increased local cost-sharing, allow for greater flexibility in defining local objectives. Allow for some version of the "shared vision" approach in plan-ning and designing water projects. This would move away from strict formulation criteria toward a consensus-building and negotiation process in which agreements are reached among stakeholders on the acceptable magnitude and distribution of costs associated with achieving a given social, economic, or environmental objective.

2. For federal portions of projects, allow the nonmonetary Environmental Quality account to be treated equally with the National Economic Development account.

3. Improve the methodologies used in the benefit/cost analysis performed under the *Principles and Guidelines for Water and Related Land Resources Planning*, addressing such changes as: discontinuing the use of "avoided costs" as measure of economic benefits for municipal and industrial projects; explicitly incorporating risk and uncertainty; providing a more comprehensive treatment of methodologies for estimating non-market benefits; including a specific discussion on the proper approach to valuing environmental quality changes; providing additional guidance on the issue of benefits transfers; and addressing the extent to which water resource projects should be required to use a discount rate that differs from the discount rate used for evaluating other federal investments.